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Empress of Ireland-Storstad Case

The Court of Inquiry closes upon One of the Most Inexcusable Collision in History

THE evidence in the Empress of Ireland-Storstad case is all in; the arguments of counsel have been heard; and the court of inquiry is now engaged in the solemn task of reaching a conclusion. There is always a wide variance in the testimony in collision cases, which is not always prompted by a deliberate attempt to mistake facts, but is rather a misinterpretation of them or confusion as to what really occurred. The testimony in this lamentable tragedy has been directly contradictory and there is no reason to believe that either side has endeavored to conceal anything. Both sides admit that the accident was wholly inexcusable. Both vessels were aware of each other's location and course. Eight minutes before the collision their lights were green to green and they should have safely passed each other. But in the fog either one or both vessels changed their courses with the result that they came together, and inside of 14 minutes thereafter the Empress went to the bottom with over 1,000 souls. Scarcely one of those below decks had the slightest chance of saving his own life. Counsel for the Storstad says:

"When the vessels sighted each other and when the fog came, both ships were on safe passing courses. Both sides admit and even contend that it is the elementary duty of every sailor when fog comes to maintain the course he was following when the fog shut him out. That the collision did occur was due to the fact that after the fog came a radical change of course was made by one vessel or the other. The only question is which ship changed her course. My contention is that it was the Empress which changed her course and that this change was due to the steering gear becoming deranged. I cannot believe that Capt. Kendall deliberately turned his ship straight across the path of the Storstad and then stopped his engines and lay in a position where we, coming through the fog and ignorant of his position, would inevitably run him down".

Described as Extraordinary Maneuver

Mr. Haight also commented upon the action of Capt. Kendall in ordering the engine of the Empress full speed astern when the Storstad was a point on the starboard bow two miles away with both vessels on a safe course green light to green light. He described this as an extraordinary maneuver and suggested that Capt. Kendall's knowledge of the fact that his steering gear was out of order was responsible for it. He contended that the collision was due to a change of course on the part of the Empress through the steering gear breaking down and that the Empress was alone to blame.

Mr. Aspinall, counsel for the Canadian Pacific, held the Storstad wholly to blame in that her helm had been thrown hard aport by the third officer of the Storstad without orders from Chief Officer Tuftenes who was in charge on the bridge. The third officer explained that Tuftenes gave the order to put the helm a little to port because the tendency of the current was to carry the vessel to port, on which side they thought the Empress was. The third officer said throwing the wheel hard aport did not alter the course of the steamer as the compass showed that she did not obey the helm. Counsel for the Canadian Pacific attached considerable importance to it, however, as he did to the further fact that the log of the Storstad was not made up until the day following the collision and after conferences with Capt. Anderson, who reached the bridge too late to be of any service. Mr. Aspinall therefore contended that the Storstad was wholly to blame.

Mr. E. W. Newcombe in summing up the evidence as the representative of the Canadian government said that he disagreed with both Mr. Aspinall and Mr. Haight as to one vessel or other to be wholly to blame and stated that it was possible for the court to arrive at a finding in the case consistent with the absence of any intention on the part of the witnesses of either side to misrepresent the facts. He thought the evidence with regard to the porting of the helm of the Storstad important testimony to the honesty of the Storstad's men. It was an admission which might go strongly against them and which might easily have been suppressed if they had wanted to make a case. He suggested that when the Empress changed her course to run down river and before she steadied upon her course she exposed her red

light to the Storstad, which vessel thereupon came to the conclusion that the two ships would pass clear port to port. Then when the fog came the Storstad, still thinking the Empress on her port bow, ported her helm with the idea of giving the Empress more room.

"So you contend or suggest," said Lord Mersey, "that neither ship was to blame or that both were to blame?"

"I am suggesting," replied Mr. Newcombe, "that there was some negligence on both sides. It seems to me that Capt. Kendall took an extraordinary course in stopping and reversing his engines almost in the track of an approaching steamer".

"You think that if he had continued his course in the fog at moderate speed," said Lord Mersey, "he would have passed clear in spite of the Storstad's course being deflected?"

"Yes", replied Mr. Newcombe.

Lord Mersey in a short concluding speech said the board had been much impressed by the ability, the fairness and patience with which counsel on both sides had presented their respective cases.

"We must now", said he, "address ourselves to the heavy task of sifting the evidence and considering the arguments of counsel. We hope in a fortnight or so to be in a position to make our report."

Storstad Held to Blame

The court of inquiry rendered its opinion on Saturday, July 11, finding the collier Storstad wholly to blame.

"We regret," says the commission's report, "to have to impute blame to any one in connection with this lamentable disaster, and we should not do so if we felt that any reasonable alternative was left to us. We can, however, come to no other conclusion than that Mr. Tuftenes was wrong and negligent in altering his course in the fog as he undoubtedly did, and that he was wrong and negligent in keeping the navigation of the vessel in his own hands and in failing to call the Captain when he saw the fog coming on.

"It is not to be supposed that this disaster was in any way attributable to any special characteristics of the St. Lawrence waterway. It was a disaster which might have occurred in the Thames, in the Clyde, in the Mersey, or elsewhere in similar circumstances.

"Such is the conclusion at which we have arrived on the question as to who was to blame for the disaster. But the question of much greater public interest and importance remains to be considered, viz.: Why the ship sank so quickly and what steps, if any, can be taken to prevent the terrible consequences which so often follow such disasters?

"The main difference between the two stories (of the officers of the Empress and the Storstad respectively) is to be found in the description of the way in which the two vessels were approaching each other at the time the Empress of Ireland changed her course, after having obtained an offing from Father Point.

As the Ships Approached

"The witnesses from the Storstad say they were approaching so as to pass red to red, while those from the Empress of Ireland say they were approaching so as to pass green to green. The stories are irreconcilable and we have to determine which is the more probable. Times, distances and bearings vary so much, even in the evidence from witnesses from the same ship, that it is impossible to rely or to base conclusions upon them. We have, therefore, thought it advisable to found our conclusions almost entirely upon the events spoken to by the witnesses and upon their probable sequence in order to arrive at a solution of the difficulty.

"After carefully weighing the evidence we have come to the conclusion that Mr. Tuftenes was mistaken if he supposed that there was any intention on the part of the Empress of Ireland to pass port to port, or that she, in fact, by her lights manifested the intention of doing so; but it appears to us to be a mistake which would have been of no consequence if both ships had subsequently kept their courses.

"Shortly after the ship came into the position of green to green, as claimed by Capt. Kendall, or red to red, as claimed by Mr. Tuftenes, the fog shut them out from each other, and it is while they were both enveloped in this fog that the course of one or the other was changed, and the collision brought about. From the evidence adducted on behalf of both vessels it is plain that before the fog, and when they last saw each other, there was no risk of collision if each kept her course. Therefore, the question as to who is to blame resolves itself into a simple issue, namely, which of the ships changed her course during the fog?

"With reference to this issue, it will be convenient to deal with the evidence connected with the Empress of Ireland first.

Liner's Course Unchanged

"No witness speaks of having seen her make any change of course during the fog, and those who were on board, engaged in her navigation, distinctly deny that any change whatever was made. There is, in our opinion, no ground for saying that the course of the Empress of Ireland was ever changed in the sense that the wheel was willfully moved; but as the hearing proceeded another explanation was propounded, namely, that the vessel changed her course, not by reason of any willful alterations of her wheel, but in consequence of some uncontrollable movement which was accounted for at one time on the hypothesis that the steering-gear was out of order, and at another by the theory that having regard for the fullness of the stern of the Empress of Ireland the area of the rudder was insufficient. Evidence was called in support of this explanation. It is not necessary to examine this evidence in detail. The principal witness on the point as to the steering-gear was a man named Galway, one of the quartermasters of the Empress of Ireland.

"He said that he reported the jamming incident to Williams, the second officer on the bridge, (who was drowned), and to Pilot Bernier. He said he also mentioned the matter to Quartermaster Murphy, who relieved him at midnight of the disaster. Pilot Bernier and Murphy were called, and they denied that Galway had made any complaint whatever to them about the steering-gear.

"Galway gave his evidence badly, and made so unsatisfactory a witness that we cannot rely on his testimony. Some evidence was called, however, to confirm Galway. This was the evidence of three men and the pilot from another Norwegian collier called the Alden, at the time under charter to the Dominion Coal company, who were the charterers of the Storstad. These witnesses spoke of having passed the Empress of Ireland on her way down the river about 9:20 (Montreal time) on the evening of May 28, and they said she was swinging and steering badly, changing from red to green several times. The witnesses do not speak of any behavior of the vessel which would suggest 'jamming', and it is to be believed that the allegation that the vessel sheered from side to side on this occasion is entirely different from the allegation of Galway that the wheel jammed.

"On the whole question of the steering gear and rudder we are of opinion, that the allegations as to their conditions are not well founded. We have consulted our advisers, and they concur in this opinion.

"It was said on behalf of the Storstad that the order to put the liner full speed astern was probably given because the Empress of Ireland had become unmanageable by reason of her defective steering gear. We cannot accept this suggestion, but we do think the stopping evidences uneasiness on

the part of Captain Kendall and a consciousness that his ship was possibly in too close proximity to the Storstad.

"We think that he would have been better advised if he had given the Storstad a wider berth, and had navigated his ship so as to pass the Storstad at a greater distance on his beam than he originally intended. We do not think, however, that his stopping, which was really done for greater caution, can be said to have been an unseamanlike act, nor do we consider his failure to give the wider berth as a contributory cause of the disaster."

The report found that there was no lack of discipline on board the Empress and that the Empress complied with all the regulations regarding boat equipment, watertight doors, etc.

To prevent such loss of life in the future the commission made these suggestions:

"First—That in foggy weather all watertight doors and port holes below the top of the watertight bulkheads be closed. Preferably they should be closed all the time between sunset and sunrise.

"Second—That it might be desirable to consider whether rafts could not be placed in such a position on the upper deck that they would float automatically on the water as the ship sank."

Localizing Sound

There has been—as a matter of course— no end of suggestions regarding methods of preventing collisions in fog such as that which caused the disastrous loss of the Empress of Ireland, and wireless for all—tramps included—the universal use of submarine signals, and several other methods of communicating from ship to ship have been recommended. But all, or very nearly all, those who give gratuitous advice forget one of the cardinal facts of the situation. They forget that no method has yet been devised for "localising" a wireless message—that is, for telling the direction or the distance from which it comes. So when the captain of a ship which is befogged receives a wireless from another ship in the same condition he does not know where that other ship is, how far away she is, or whether she is heading towards him or away from him. He knows she exists within range of his receiving apparatus, that is all. If the fog has just newly settled down both vessels will know their bearings, at least approximately, or one of them may happen to know her bearings while the other does not. In the latter case the knowledge is of very little value to either of them, as they cannot know their relation to each other.

Submarine signalling suffers from the same defect in that it cannot help one vessel to "locate" another. Granting that two ships have lost their bearings in fog, they can talk to each other, but they may be steaming right up against each other for all that wireless or submarine signalling can help them. I have heard of a system of "localising" the sounds of syrens, so that the receiving ship may tell very closely the direction from which a sound comes. Everyone knows that though the sound of a syren may be heard very clearly in fog, it is difficult to say accurately the direction in which the vessel lies from which the sound is coming. If this difficulty alone can be overcome, an important point will have been gained, and it will not be surprising if "localising" is accomplished through the old-time syren rather than through the newer wireless or submarine signaling. But even then the difficulty of estimating distance will remain. In this question of communication between ships in fog there is great scope for the inventor, for, with all the scientific apparatus which now crowds the bridge of a large passenger liner, the captain is really as helpless when fog comes as he was twenty years ago. He must just grope his way at dead slow speed, and keep his syren continually shrieking, and for the rest trust to his lucky stars. The man who devises means of measuring distance and determining direction at sea in fog will be the greatest possible benefactor of the mercantile marine, and will deserve thoroughly all the fortune his invention may bring him. —*Fairplay.*

What Captain Norton Says

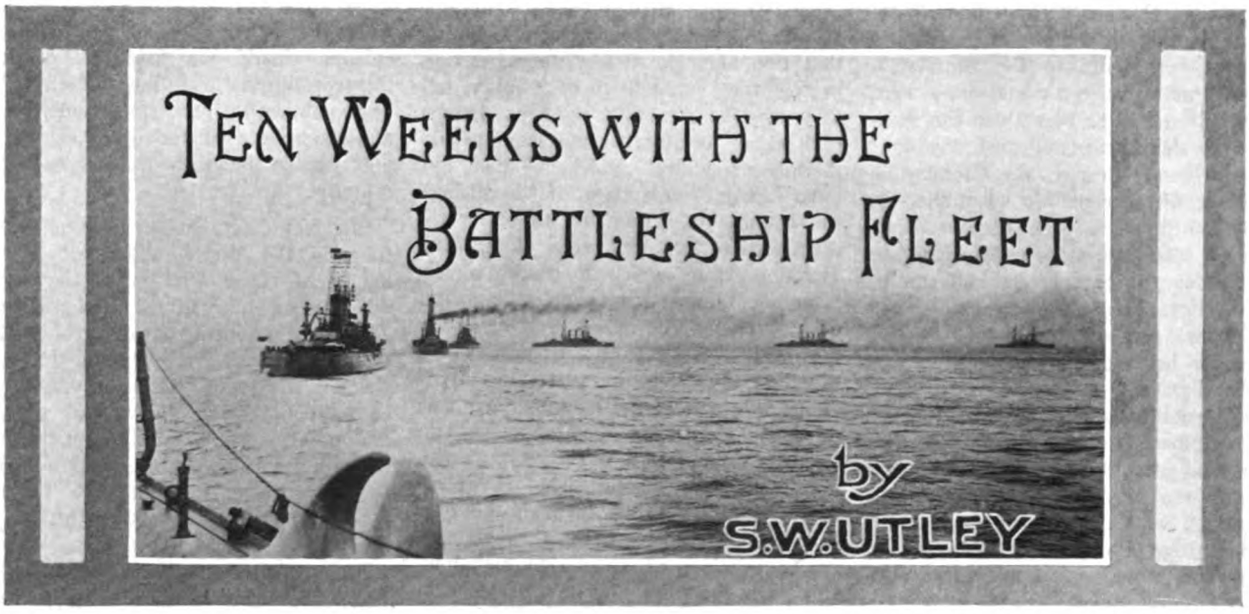
Capt. George L. Norton, for many years an experienced navigator and now the editor of the *Marine Journal,* expressed his views to the *Journal of Commerce* as follows:

"It is a bold statement to make, but none the less true, that the three notable collisions in fog at sea within the year 1914, that of the Nantucket and Monroe, Empress of Ireland and Storstad, New York and Pretoria, each were avoidable, and the blame for each lies with one or the other or both of those in command at the time. In each case wind, sea, or fog did not prevent whistles being exchanged and heard, locating to a degree the proximity of an approaching vessel. Consequently, there was no reason for not stopping their engines, and cautiously feeling their way past each other under headway sufficiently slow to enable stopping either ship in less than her length, even if not discernible through the density of the fog, each vessel continually blowing her whistle to determine whether she was nearing or drawing away from the other. These collisions were caused through lack of careful navigation. The penalty for such accidents should be heavy and fixed through international law. Each vessel had unlimited space to maneuver in and pass clear of the other if the reports made by their respective representatives are true.

"Perfect safety at sea at the present time is the desire uppermost in the minds of those who cross the ocean, whether on business or pleasure bent. The most eminent naval architects of this country and Europe claim that non-sinkable fire-proof passenger vessels can be built beyond a doubt; but whether the great cost could be compensated through returns in earnings is a matter for the operator to determine. Let that be as it may, I believe that there is no necessity for such costly experiments. It has been proven that with all their fury, the wind and sea have never been able to founder the South Shoal Lightship off Nantucket anchored outside of land in the broad Atlantic for many years, which has weathered every gale, and after each had done its worst with its mountainous seas, this stanch, steel hull lay at her moorings as gracefully as the gray gull that spends a lifetime on its surface. True, this Lightship has parted her moorings several times, but after the gale abated has been returned to her station uninjured. This is satisfactory proof that the modern ocean steamship, constructed with even greater strength in comparison, will float for any length of time if given sea room.

"All or nearly all the modern built ocean-going steamships, transatlantic and coastwise, are able to withstand the elements; collision and fire now being the only great and dreaded dangers. The best proof that even these can be reduced to a minimum needs only reference to the record of the Cunard Line, which since 1840 has been constructing and operating a transatlantic line of ships between this port and Great Britain, providing them with every known device that would add to their safety, and during this 74 years' career they have lost but one ship, no fires, and the only loss of life was that of five persons being washed overboard by a big sea.

"The foregoing record is my reason for stating that there is no necessity for building ships with their passenger and cargo spaces largely taken up with bulkheads athwart ships and lateral from double bottom to deck. The Aquitania, Olympic, Imperator, Mauretania, Lusitania, Vaterland and others now built and building are everything that is needed to provide the necessary safety at sea as far as the ship is concerned.

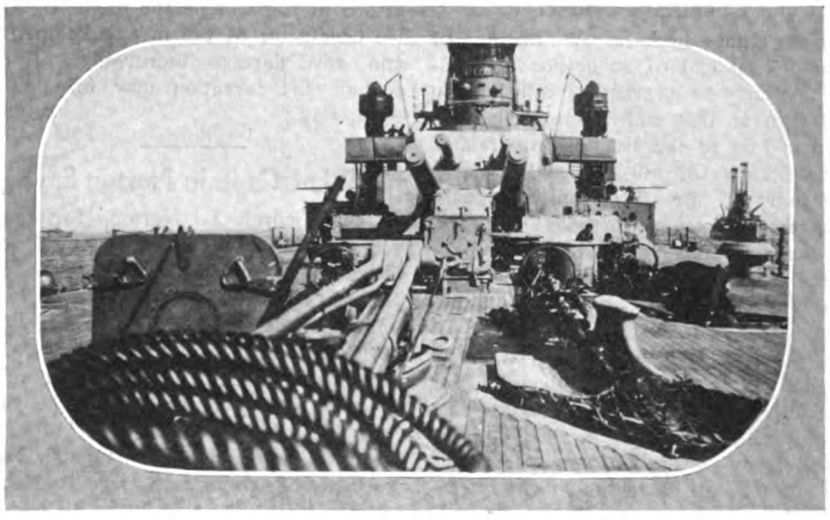


EXECUTING COLUMN RIGHT. NOTICE THE PERFECT DISTANCE BETWEEN THE SHIPS THAT HAVE TURNED

I WAS standing on the forward deck of the Utah on a beautiful April morning in 1912, as we plowed through the waters of the Southern drill grounds, just below the Virginia Capes. Off on the horizon great water spouts caused by the dropping shells were dissolving into mist while the acid fumes of burning powder were all around us and the decks were still strewn with the remains of burning powder bags. Men were streaming out from the turrets and battle stations for the first division of the Atlantic fleet had just fired the last shot of its division battle practice. A young ensign, just out from his turret, attired in overalls and with an old cap on his head, turned to me and with flashing eyes exclaimed—"I don't care what they say, Utley, *it is the greatest game in the world.* Football, baseball, rowing—none of these can touch it." I only hope that the readers of this article can catch something of the enthusiasm of this young officer, some of the intense interest of this great game in which each pawn is a battleship and each team is composed of from 600 to 1,000 clean-cut energetic young Americans, each one striving with all that is in him to bring to his ship what is probably the most prized piece of bunting in the world—the Gunnery trophy of the United States navy.

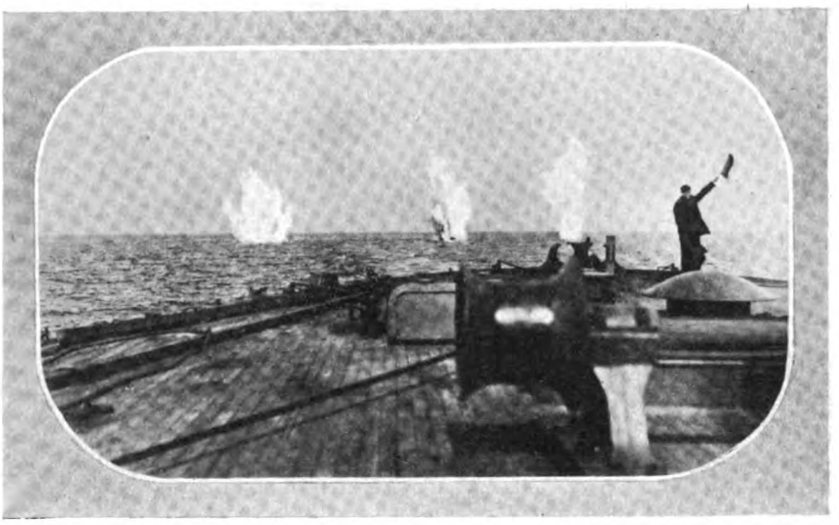
When you reduce the naval problem to its final analysis, it consists in the ability or lack of ability to *land the greatest number of destructive shells upon the enemy's ship in the shortest space of time.* Navy yards, ships, guns, organization, strategy—all exist for this one final purpose, for there is no use in building ships or getting them into the battle line unless they can shoot straight. Every day's routine has this final object in view. Twice each year these ships go out on the target range and strive with actual powder and shell to show just what they can accomplish with their big guns. In the record practice, the best gun pointers in each turret strive for supremacy and for a permanent position at the trigger; in the battle target practice, each ship goes out as a unit and endeavors, under as near battle conditions as possible, to establish her right to fly the gunnery pennant. The battle practice under discussion covers four kinds of work. Individual practice in which each ship competes by itself; division practice in which four ships composing a division were firing at once for a division record; torpedo runs when these very interesting weapons were discharged at opposing divisions and the night practice in which the ships are darkened and the 5-inch guns discharged at targets which have been located by means of the search lights.

The main battery guns on the modern ships are all of 12-inch or 14-inch inside diameter and are mounted in turrets. These are small house-like structures, composed of heavy armor so shaped as to present a glancing surface to the enemy's fire and capable of being swung in any direction. The men enter through a trap door in the floor of the over-hanging part. The barbette, a great armored cylinder which supports the turret extends in one unbroken piece clear down into the bot-



UTAH FROM BOW, STRIPPED FOR TARGET PRACTICE

tom of the ship, protecting the turret handling mechanism and giving an armored passageway for the hoisting of ammunition. At the base of this on one side is the shell room where the great shells are carefully placed in large racks and on the other side the magazine where smokeless powder contained in bags about 14 inches in diameter, 12 inches high, weighing 75 pounds per bag is stored in cans, there being two bags to each can. The magazine is connected with the handling room by a chute which is fitted into a heavy steel door in which there is a hole just large enough to let the powder slide through this being covered by a swinging plate which drops into place as soon as the powder has passed it, providing a flame-proof shutter keeping the magazine shut off from the handling room at practically all times. Various devices are used to hoist the ammunition to the breach of the guns, but it is noticeable that the tendency now is to go back to the old method of passing it up by hand and thus to get away from a large amount of complicated machinery which may go wrong at the critical moment. When the gun is loaded, the breach block is swung back, the shell weighing approximately 900 pounds is hoisted first and rammed home. Two bags of powder are then rammed in behind the shell, two additional bags behind these two, making about 300 pounds for the discharge of a 12-inch gun. The breach is closed and locked, cap put in and the gun is ready for firing. A snappy gun crew will load in from 40 to 50 seconds with the shell in the shell room and the powder in the magazine. Twenty seconds is sufficient to load the second time, as a part of the work is being done while the first shot is being fired.

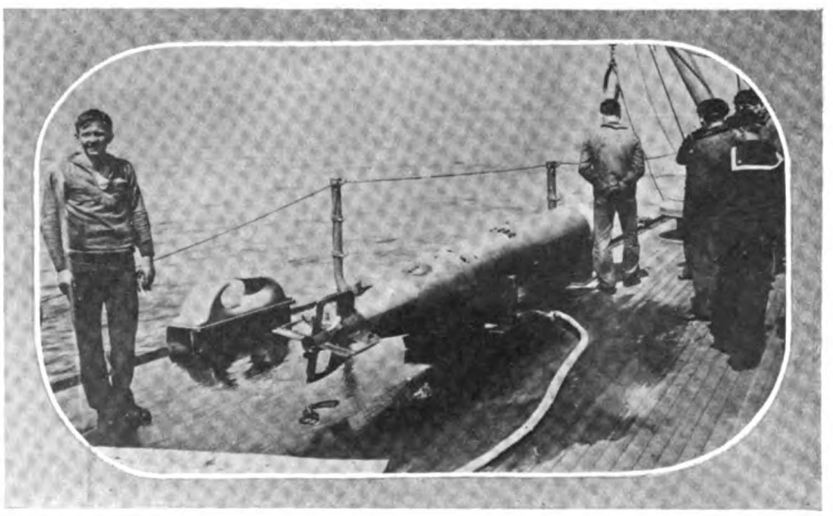


THE OHIO TOWING THE TARGET AT WHICH THE UTAH SHOT, SHOWING THE EFFECT OF A WELL-DIRECTED SALVO

The entire turret swings in azimuth carrying both guns, while each gun is elevated or depressed independently of the other. The sights are equipped with powerful telescopes containing delicate cross wires and are so attached to the gun that they can be adjusted to make up for the effect of varying range, speed, wind, etc. To actually aim these big pieces requires in addition to the men figuring the range and setting the sights, three men, namely, a trainer, who by swinging the full turret (two guns) from left to right, brings the vertical cross wire of the telescope to the center of the target and a pointer for each gun who brings the horizontal wire of the telescope of his own gun to bear on the target. These men's sole work is to keep their respective cross wires constantly on the proper part of the target so that whenever the gun is ready to be fired, her sights will be steady on the mark at which she is to shoot.

The targets are rectangular, 60 feet wide by 30 feet high made of upright 4 x 4 feet with cross battens, the whole being covered with ordinary fishnets. They are floated on rafts formed of solid 12 x 12 timbers, the raft being about 5 feet wide by 100 feet long and drawing 25 feet of water, entirely awash except for a small piece at the bow and stern. Each target is towed by a battleship, the line being 400 yards in length and sometimes when you are towing and the big shells are dropping all around the target, you wonder whether this tow line isn't a bit short and whether some trainer might not make a mistake of a quarter of a point in directing his fire and put the shell into you instead of the screen.

Actual target practice is the culmination of a long season of training. It is obvious that it cannot be indulged in very often. The firing of the big guns even with slightly reduced charges is an expensive proposition and requires a good deal of sea-room for it is not safe to discharge guns shooting ten or fifteen miles promiscuously. In addition to this, the life of one of them is only about 125 shots after which it has to be bored out and re-lined. The result is that several interesting devices have been invented to train the men without incurring these disadvantages. In many cases a one-pound gun is securely strapped on top of the 12-inch guns. A small target is used at a short range and the big gun is aimed at it, precisely the same as would be done if it were actually going to be fired. When the trigger is pressed, however, the one-pounder alone is discharged and the result of this fire tells accurately what would have happened had the big gun been discharged. In other cases a rigging known as a "Dotter" is attached, which, upon the



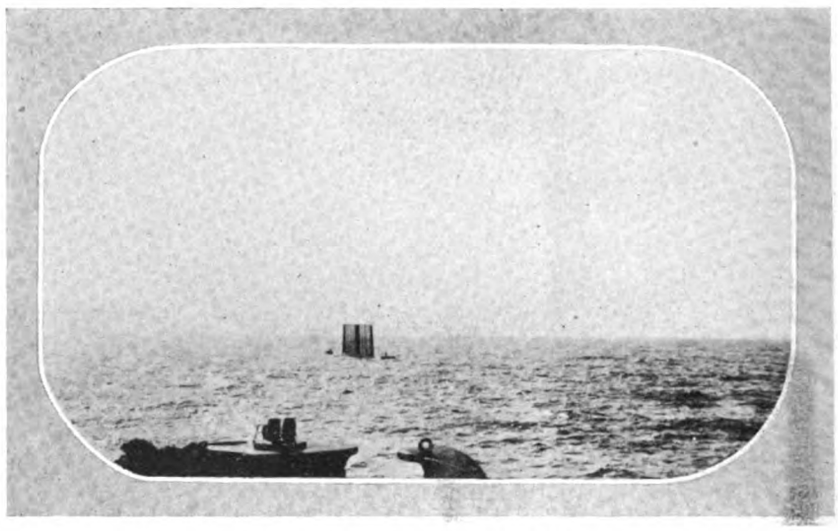
A 21-INCH TORPEDO BOAT ABOARD THE UTAH

pressing of the trigger of the large guns projects a pin point through a tiny target, demonstrating in this way the accuracy of the aim of the pointer and the trainer. In other cases, a telescope is attached to the turret in such a manner that its cross wires bear on the target the same as the cross wires of the gun sights, so that an officer sitting behind it is able to check the men and to determine whether they are actually on the target when they fire. Some one of these devices is used almost daily throughout the year and it is only after the most skillful pointers have been chosen and very carefully trained that the ship goes onto the target range and actually loads her guns with powder and shell.

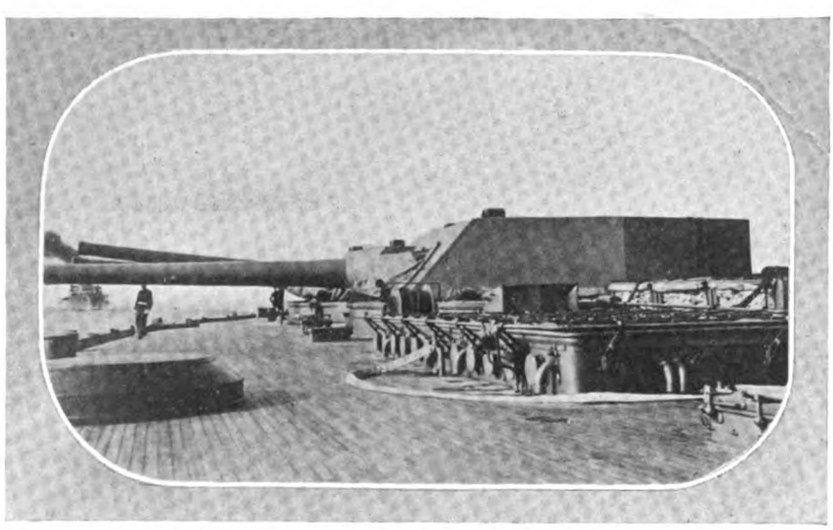
Just as closely as possible, battle practice is made to simulate actual battle conditions. The crews have been in training for months working day and night against the stop watch until each man fits into his position like a cog in a well-oiled machine. Ordinary ship routine and drills are forgotten. A nervous tenseness pervades the entire organization, such as is seen only in the camps of university athletes, getting ready for the final battle of the season. The men think and dream of nothing else. For the time being, their entire life is being concentrated on the few brief moments when they will be on the target range and will have a chance to give a concrete illustration of the training of the months gone by.

The scheme of no two practices is exactly alike but the following which might be used will give some idea of the way in which the work is done. It assumes that the four ships of one division are to engage in individual practice, each one firing in turn at its own target, the results to figure in the competition for the gunnery trophy. It should be noted, however, that this result is not based on the number of hits but rather on the number of *hits per gun per minute,* the element of fast shooting being as important as the element of accurate shooting.

On the morning of the practice the towing division, consisting of four ships, steaming in column about 2,000 yards apart each one with a target 400 yards astern of it, start out on the base course which we will assume in this case to be north. As soon as this division is under way, the firing division starts on a course due west at a speed of 15 knots (17¼ miles) and runs for 36 minutes. In the meantime the commander of the towing division has opened his sealed orders and finds that instead of steering due north, he is to go northeast for eight minutes at a speed of eight knots, then north by east for four minutes at a speed of six knots, etc., the object being to so alter speed and direction that by the time the firing division gets into position, it will have no accurate knowledge as to either the course or direction of the towing ships. When the firing division has run its 36 minutes, the commanding officer puts his helm over and heads his ships in such a direction as will bring the flagship in a position where the rear target will bear one point forward to beam, at, we will say, 11,000 yards distance at the earliest possible moment. This of course is equivalent to figuring a course which will bring him in an advantageous position as regards an enemy in the shortest space of time. When the flagship reaches this position, it immediately opens fire on the rear target and continues until the amount of ammunition allowed for the practice has been expended or until the target is a certain angle abaft the beam. The division then steams on and when the second ship has come into the same relative position in reference to the No. 3 target, it opens fire in the same way and the practice is continued until all ships have fired at their respective targets. The minimum range used in this practice is 11,000 yards or about 6¼ statute miles. The speed of the firing ship is 17¼ miles and that of the towing ship is unknown, depending on the instructions given in the sealed orders.



TARGET BEING TOWED BY UTAH

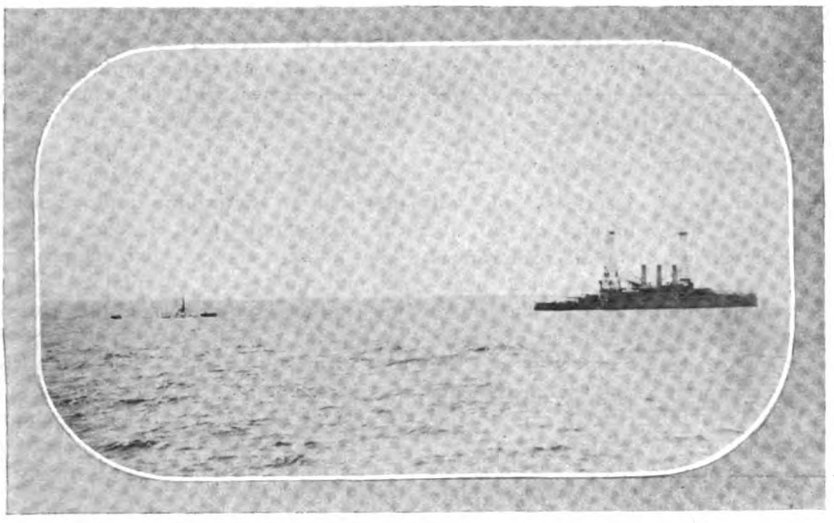


CLEARED FOR ACTION. TWO AFTER TURRETS OF UTAH TRAINED TO PORT A FEW MOMENTS BEFORE TARGET PRACTICE

On the morning of our individual practice, I climbed up to the spotting platform at the top of the main mast, although it must be confessed not without a good deal of misgiving, but as I had accepted the invitation of the officer in charge of that station, I felt that it was up to me to ascend to this high elevation and watch the battle from there. There were a half a dozen of us on the platform, most of them with telephone receivers strapped over their heads, putting them in communication with all parts of the ship. General quarters had long since been

sounded, decks were cleared, life lines taken down, the crews had all taken their posts and save for the signalman, no sign of life could be seen aboard the great ship, but as the target gradually came back toward our beam, one could notice that the angle of the great guns was imperceptibly but constantly changing and that no matter where the target was, like a finger of destiny, the mouths of the great guns were covering it. Gradually the range got shorter and shorter until of a sudden your feet seemed to drop out from under you as though someone had struck you back of the knees with a club, and a flash and a deafening roar announced that the No. 2 turret had fired its two guns as a ranging shot and that the long awaited practice was on.

It takes fifteen seconds for the shells to travel from the guns to the target and this time seemed like as many minutes, but as we waited suddenly two great spouts of white water shot up 200 feet into the air and we noticed that one was beyond and the other this side, due to the fact that the ordnance officer had purposely tried to straddle the target with his ranging shot so as to be able to more easily estimate the error. There is only one way to get exact ranges when firing at these long distances and that is by "spotting" or judging by the splash how much the shot has gone over or fallen short and then by correcting the range by this difference. In this case the sight bars were set at 11,000 yards and the shot apparently fell short 100 yards so that it is evident that the range should have been 11,100. The spotter judged that the target was on a diverging course and that before the next shot was fired, the range would have increased 100 yards so he telephoned down the order "Up 200" and the sight bars were raised to correspond. A few seconds more went by and the guns in one of the after groups let go and we saw that the second ranging shot was much nearer than the first. Another correction from the spotter, a few seconds more until all was steady, a blinding flash and a roar, a tremendous whip on the tower on which we were standing and we knew that the remaining six guns had sent forth their messengers in one simultaneous shot and then for a few minutes, calmly and quietly, without confusion or noise of any kind, save for the tremendous roar of the explosion, broadside followed broadside until at the end of six or seven minutes the target had absolutely disappeared from our view! The men at the guns with their high powered glasses could still see its forward flagstaff and still tried to cut that slender pole six miles away until the fire control officer finally decided that he was wasting time and ammunition and that he would stand on the record already made. In a few seconds over ten minutes, we had fired 49 shots and were credited with 17 hits, although for a large part of that time there was practically nothing for the men to shoot at. In the practice last spring, the Arkansas scored six hits from the two guns in one turret in 57 seconds, a record which speaks wonders for the accuracy and efficiency of the men who manned her guns.



UTAH'S TARGET BEING TOWED TO BASE AFTER FIRING. UTAH FIRED 47 SHOTS BUT TARGET WAS BROKEN INTO THIS CONDITION AT ABOUT THE TWENTIETH SHOT

Torpedo defense drill is extremely interesting, taking place at night which is the only time that torpedo destroyers would be able to attack a battle ship. The target is conical in shape, only 9 feet across the base resembling the wedge shaped bow of a torpedo destroyer coming head on and is about two miles away. As the ship goes onto the range, every light is turned off, absolute darkness prevailing. At a certain point the search lights are turned on and endeavor to hunt out and pick up the target, holding it illuminated while the 5-inch battery opens fire. The shells from these guns are fitted with flaming torches which burn as they go through the air, lighting their path and enabling the spotters to follow their course. After running for three or four minutes, the ship is again darkened for a period, relighted, targets picked up again and fire resumed. It is easy to see that under such conditions accurate shooting is not easy and good scores at night practice are the exception rather than the rule. It also makes one think that unless a fleet is well protected with a heavy screen of destroyers, (in which our navy is woefully deficient), the enemy's boats have a pretty fair show of getting in close enough to launch their deadly torpedoes under cover of darkness.

One of the most interesting practices of all is the torpedo run. These engines of destruction are launched from tubes fitted in the sides of the battleships at right angles to the keel, compressed air being used to drive the torpedo from the ship. After one is once launched, it is beyond the control of those who have sent it forth and must depend entirely upon its own motive power and directive force. The former is supplied by two screws revolving in opposite direction, driven by air engines whose power consists of air under the pressure of 2,250 pounds per square inch, which is carried in the main body of the torpedo. A horizontal rudder operated by a pressure diaphram keeps the torpedo traveling at any desired distance under the surface of the water. A vertical rudder operated by a gyroscope keeps it running in the direction determined upon before it is fired. The minimum effective range is about two miles and the speed 28 knots per hour. After the torpedo leaves the ship, the bubbles formed by the escaping air often enable one to follow its course and when the opposing ship is firing at your own, you can often times pick up these bubbles nearly a mile away and watch the course of the torpedo as it comes toward you. After the air is exhausted, the torpedoes rise to the surface like a great fish and the fleet stops, lowers boats and searches until they have been secured and returned to the ships.

All in all, battle target practice is an exceedingly exciting and interesting experience and any one who has been through it is not likely soon to forget.

Regulating Water Carriers

A Bill to Regulate Carriers Engaged In Foreign and Domestic Service

AS THE outcome of the recent investigations of shipping combinations by the committee on the merchant marine and fisheries of the house of representatives, Congressman J. W. Alexander, chairman of the committee, will introduce a bill to regulate carriers by water engaged in foreign and interstate commerce of the United States. The proposed legislation is of special interest and significance as the first attempt to bring the vast water transportation interests engaged in American foreign and domestic commerce under a comprehensive system of government supervision. The bill covers all the recommendations made by the committee in its recent report to the house with the exception of those relating to the Interstate Commerce Commission's supervisory power over the division of through rates between railroads and domestic water carriers, and the issuance of through bills of lading and the giving of access to their terminal facilities by railroads to water carriers on equal terms. These supervisory powers, it was felt, the Interstate Commerce Commission now possesses under the terms of the Panama canal act, especially in view of the construction given to this act by recent decisions of the commission.

Operate Under Agreements

The report of the committee showed that it is the almost universal practice for steamship lines, both in the foreign and domestic trade, to operate under written agreements, conference arrangements or gentlemen's understandings, which have for their purpose the control of competition between conference lines or between them and non-conference lines, and explained in detail the advantages and disadvantages of such agreements. The purpose of the bill is to preserve to shippers, through effective government control, the advantages which can be secured only by permitting the several carriers in any given trade to co-operate through some form of rate and traffic arrangement, and at the same time prevent the abuses which the committee found to exist. In view of the evidence collected by the committee, the bill declares all deferred rebate arrangements, whether in export, import or interstate trade, to be illegal. Full copies of all agreements, understandings and conference arrangements (or if oral a complete memorandum), as well as all subsequent modifications and cancellations thereof, must be filed for approval with the Interstate Commerce Commission. The commission shall approve or disapprove all such agreepowered to order any agreement cancelled or modified. Such agreements as are approved by the commission shall be excepted from the anti-trust laws. Full jurisdiction is also given to the commission to supervise all traffic or rate associations to which any common carrier by water in interstate commerce may be a party either directly or indirectly.

Discriminatory Practices

Discriminatory practices of all kinds, such as rebating in all its forms, the giving of unfair preferences or advantages to persons and localities, and discrimination through false billing, false classification or false weighing are made unlawful by the bill. Both foreign and domestic carriers are prohibited from employing "fighting ships"; retaliating against any shipper by refusing, or threatening to refuse, space accommodations when such are available, or resorting to other discriminating or unfair methods; inducing or influencing any marine insurance company or underwriter to unjustly discriminate against a competing carrier; or giving information concerning the nature, quantity, destination, consignor or consignee of property offered for shipment to the prejudice of the shipper, consignee or any carrier. If any common carrier by water in interstate commerce reduces its rates to or from competitive points below a fair and remunerative basis with the intent of driving out or injuring a competitor, it shall not be permitted to increase such rates unless after hearing by the commission it shall be found that such proposed increase rests upon changed conditions other than the elimination of said competition, and jurisdiction is conferred on the commission to determine questions of fact as to whether the carrier did reduce rates with the intent of driving out or injuring a competitor.

Whenever, after full hearing upon a complaint, or on its own initiative, the commission shall be of opinion that any rates charged by a carrier in foreign commerce are unreasonably high, or unjustly discriminatory between shippers or ports, or unjustly prejudicial to exporters of the United States as compared with their foreign competitors, or represent an unjust relation between classes of commodities, the commission is empowered to determine, prescribe (and order enforced) what shall be just and reasonable rates and charges to be thereafter observed as the maximum. Carriers in interstate commerce must file their rates with the commission, and the rates as filed cannot be increased except after 10 days' notice to the commission, which is empowered to determine and prescribe the maximum rates to be charged. The commission is also empowered to investigate all complaints, charging unfair treatment of the shipper in the matter of cargo space accommodations, or unfair or discriminating contracts with shippers, or unfair treatment in the settlement of claims, and to order the discontinuance of all unfair or discriminating practices found to exist.

Railway to Water Transportation

Several sections have an important bearing on the relation of railroads to water transportation. It is made unlawful for any railroad to discriminate between a rail and water route, between the same points, by charging more for the same transportation service, having due regard for reasonable extra terminal charges and other expenses involved on water-borne commodities moving between said points than they charge on the same kind of commodities for the proportionate share of the all-rail haul. Railroads are prohibited after the passage of the act to acquire any interest either directly or indirectly, in any canal in the United States, or in any common carrier or forwarding company on such canal, unless such acquisition is approved by the Interstate Commerce Commission as being in the public interest. Railroads can also be required by the commission to

account separately for the income, expenditures and other financial and property characteristics of any common carrier by water in interstate commerce, which at present may not be separately incorporated but whose identity is merged with the general property and income account of the railroad.

Various other sections relate to penalties, jurisdiction of offenses and methods of enforcing the act. The bill extends to the commission in the execution of the act the powers granted to it by the present interstate commerce laws in so far as they may be applicable to the enforcement of the act, and not inconsistent with its provisions. In view of the added duties prescribed by the bill it is provided that the Interstate Commerce Commission be enlarged to 11 members. This would mean the appointment by the commission of four additional members.

Tin Recovery Dredger

Wm. Simons & Co., Ltd., of Renfrew, have just completed and despatched to Penang, for the Tongkah Harbor Tin Dredging Co., a large and powerful dredger for working in alluvial tin deposits, this being the fourth dredger of this class which this company have had constructed by Messrs. Simons within recent years. The buckets are of the built type of strong design, the cutting lips being formed of special hard steel. The bucket ladder is constructed in the most modern form of girder work and designed for dredging to a depth of 55 ft. under water level. The upper and lower tumblers are of cast steel with special hard steel renewable bearing bars; the lower tumbler in two pieces designed to work in special bearings of cast steel and chilled iron. The buckets will discharge the material into shoots lined with steel bars, and from thence into the screen. The screen will be of the revolving type with graduated perforations and driven by friction gear at upper end. A set of horizontal compound condensing engines fitted with air and feed pump, are installed to drive the dredging gear. The dredger is fitted with Bluck's patent drop chute. Steam is supplied from locomotive type steel boilers constructed for a working pressure of 150 lbs. per square inch. Independent auxiliary steam feed and bilge pumps with connections to tanks, water boat and bilges are to be provided. Feed filter, meter and special vertical steam feed heater are also fitted. The dredging gear consists of spur gear with large and powerful friction clutch, so that the buckets can be disconnected at will, while the screen gear may be kept running; the screen gear is driven direct from the engine. Water is supplied to the screen by one 16-in. centrifugal pump driven by vertical compound engines. The pipe from water pump will enter the screen at lower end and will be perforated for its full length. The saving tables are very large and are of an area suitable for the special material to be dealt with.

In addition to the tables special launders are fitted on each side of the dredger. These launders will be provided with riffles for their entire length so that no paying material may be lost. The launders will also serve the double purpose of carrying off the tailings from the tables sufficiently far astern that even the soft material will not run back upon the buckets. A large and powerful mooring winch driven by an independent two-cylinder high-speed engine is fitted on deck. It has six independent wire rope barrels, one for head moorings and four for side moorings, and one emergency barrel. All the barrels are arranged to work independently or conjointly. The ladder hoisting gear is also driven by an independent two-cylinder high-speed engine. Large tanks are fitted up on board for feed water, and storage space for a large amount of wood fuel. A special feature of this vessel, as with the others, is that all working parts were carefully made to gage, and duplicate parts made for templates, so as to be entirely interchangeable.

The hull is of steel with steel decks throughout fitted with beltings at water line, and of special strong construction to meet the various strains due to this class of work. All framing carrying the gearing, bucket ladder, screen and tables, is of steel built in single web section, to facilitate inspection and painting.

Steamer Camino

The Camino built by The Craig Ship Building Co., Long Beach, Cal., for Swayne & Hoyt, San Francisco, is 300 ft. long, 44 ft. beam, 28.5 ft. deep and has a carrying capacity of 5,000 tons. There are four watertight bulkheads and two steel decks, the lower deck extending to the boiler room bulkhead and the upper deck running the full length of the steamer. The double bottoms extend from the collision bulkhead forward to the stern tube bulkhead, affording room for a fuel oil capacity of 4,000 barrels.

The tanks are operated by filling pipes on both sides of the vessel, and are connected to a series of manifolds piped to a horizontal duplex ballast pump having steam cylinders of 10-in. diameter and water cylinders 12-in. diameter by 12-in. stroke, in addition to three fuel-oil pumps which can pump either direct from the double bottoms or, in case of extreme low temperatures, from the settling tanks fitted in the boiler room.

The valves to the double bottoms are so arranged that the tanks may be filled through the pipes by which the ballast pump empties them. These pipes are 8 in. in diameter and, as the tanks extend across the ship, provision has been made for drawing water from either side of the tanks so that they may be pumped out completely should the vessel become listed to either side; and as the fuel oil is consumed the tanks may be filled with water. The double bottoms are divided into five water-tight tanks, with the additional precaution of a water-tight cofferdam between tanks.

The ship is equipped with a complete outfit of deck machinery of the latest type, consisting of a windlass engine, steering engine, and four horizontal hoisters designed and built by the Craig Shipbuilding Co., in addition to two vertical geared winches, two friction winches, and a Hyde capstan engine.

There are four 24-ft. lifeboats carried in davits on the after deck house in addition to working boats and life rafts, life preservers, life buoys, and other life-saving apparatus.

The ship is equipped with three steel masts, each having cargo booms 75 ft. in length stepped in forged steel sockets riveted to the mast. There are also two booms fitted on the main deck at No. 3 hatch, and an extra heavy boom fitted on the forward mast in forged steel socket and reinforced steel plating, capable of lifting 20 tons. The cargo hatches are 31 ft. long and 18 ft. wide.

The officers' quarters are arranged in a house on the bridge deck, and are sumptuously furnished, finished in white enamel and hardwood, having roll top desks and elaborate toilet fixtures with running water.

Capt. R. H. Ahlin of the Camino, who is the commodore master of the fleet, has been in the company's employ for many years, and personally looked after the fitting out of the company's latest steamers. He is a master mariner of wide experience both in the coasting and foreign trade, and has established a reputation for skill and assurance equalled by few and surpassed by none. The captain's quarters are on the main deck amidship, where he has an outlook fore and aft and on

the sides. They are elegantly fitted in white enamel paneling with mahogany wainscoating. He has a private bath, lavatory, bedroom, and office, the latter upholstered in green plush, with olive-green carpet. There is telephone communication between the captain's quarters and all parts of the ship.

The deck house amidships is surmounted by a pilot house with a private stairway leading to the chart room and lavatory for deck officers. In the pilot house is a solid brass steering pedestal with electrically illuminated compass and brass steering wheel, submarine signalling apparatus, alarm systems, searchlight operating gear, and telephonic communication with all parts of the ship.

Passenger Accommodation

On the bridge, extending the full width of the vessel, are a Lord Kelvin standard compass, encased in mahogany and brass, two steam whistle levers and two electrically illuminated engine room reply telegraphs on heavy finished, brass stands.

The firstclass passenger accommodations are amidships and in the after end of the vessel. All staterooms are outside. They are finished in hardwood and white enamel and are richly carpeted. The toilet accessories are of the latest approved design, heavily nickel-plated mountings, heavy porcelain basins, and French plate mirrors encased in nickel frames. All of the toilet fixtures were supplied by the Los Angeles and San Francisco branches of Crane Co.

The first-class dining saloon is a handsomely appointed apartment, decorated in gold and white enameled panelling and gold decorated fluted side stanchions. The furniture and general appointments are elegant, and there is more than the usual space between chairs and tables. The entrance is from the social hall by means of a solid mahogany stairway. The skylight over the dining room and social hall is exceptionally large and so arranged that the whole top flat may be raised, thus making it especially suitable for a warm climate.

The second-class accommodations are in the forward part of the vessel and are well equipped, special attention having been paid to ventilation and sanitary arrangements. The crew's quarters also are in the forward part of the vessel and are well fitted with large lavoratories and hot and cold shower baths. The beds are all furnished with spring mattresses. The rooms are well ventilated with side ports and cowl vents, and the quarters are heated with radiators.

The assistant engineers' quarters are on the lower after-deck, as are also those of the steward's department. The chief engineer's room is on the main after-deck within easy access of the engine room. It has direct telephone communication with every part of the ship, and is handsomely and comfortably furnished.

The propelling machinery is in the extreme after end of the boat. The main engine is of the triple three-crank type, with cylinders 22, 36, 61 in., having 42-in. stroke. They were designed at the engineering works of the Craig Shipbuilding Co. by A. L. Becker. The cylinders are arranged from forward in the following manner: high pressure, intermediate pressure, and low pressure. All the valves are operated by the double bar Stephenson link motion. There are three front and three back cast-iron columns, the latter acting as guides for the crossheads. The piston rods are of steel, 8 in. in diameter and fitted with the best metallic packing. The engine is equipped with a direct-acting steam reversing gear. The propeller is a four-blade, built-up cast iron wheel 14 ft. in diameter.

The main boilers, three in number, are of the Parker water-tube type, placed athwartships. They are fitted to burn oil or fuel. The auxiliary machinery in the engine room consists of air and bilge pumps connected to the main engines; two main feed pumps 12 x 18 x 24, simplex; one vertical fire pump 8 x 7 x 12, duplex; one horizontal ballast pump, 10 x 12 x 12, duplex; one centrifugal pump 8 x 8x12; two horizontal fuel pumps 6x 4 x 6 duplex; one horizontal settling tank pump 6 x 5¾ x 6 duplex; one horizontal evaporator pump 4½ x 2¾ x 4 duplex; one horizontal sanitary pump 6 x 5¾ x 6 duplex; one horizontal boiler circulation pump 5 x 3 x 6 simplex; two hand fire pumps, 5 x 10; one Sturtevant dynamo engine, 6 x 6 10 kw.; one DeLavel turbine dynamo 10 kw.; one Stevens ice machine 6 x 6.

Crane valves and fittings are used throughout.

Suez Canal Traffic

The report of the Suez Canal Co. for 1913 states that 10 years ago vessels recording more than 4,000 tons were not 22 per cent of the total passing through the canal; last year they were over 44 per cent. Ships of over 6,000 tons 10 years ago were but 1 per cent of the total; last year they were 5 per cent. In 1912 the average time was cut down by 35 minutes to 16 hours 19 minutes, which was maintained last year. Last year 5,085 ships used the canal. The year 1913, while the total trade done was less than in 1912, showed a marked gain in the tonnage of loaded merchant ships. The quantity of merchandise carried was 25,775,000 tons, a record figure. The heavy business was bound east and south. In included coke from Great Britain, sugar from Adriatic ports, petrol from Russia and the United States, and phosphates from Algeria and Tunisia. A special feature was the size of the consignments to India and farther eastern ports of worked metals, machinery and railway material. Burma, Siam, Indo-China and East Africa are increasing their trade with Europe. China and Japan are steadily and largely expanding their business, while India has from the first been a main supplier of traffic. The region directly tributary to the canal is also developing new industries.

Shaft to Titanic Engineers

Impressive scenes marked the unveiling of a memorial to the Titanic engineers by Sir Archibald Denny at Southampton, April 23. Ten thousand persons were present, and in the foreground was a sad group of widows whose husbands went down with the ill-fated vessel. The central feature of the statue is a figure of Glory resting upon a boat's bow in bronze.

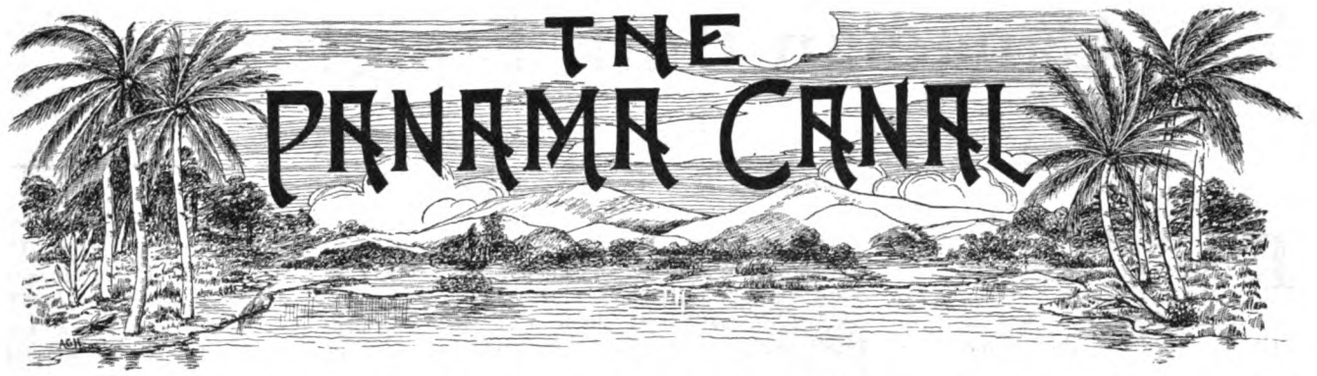
The steamer I. W. Nicholas, which went ashore at North Point, Lake Huron, last Nov., has had 72 ft. taken out of her amidships, and will be made of Canadian canal size.

Extensive alterations have been made at Manitowoc on the steamer Livingstone, owned by Wm. Livingstone, president of the Lake Carriers' Association. The vessel, which is of composite hull construction, has received new steel decks, replacing her former wooden decks. New steel coal bunkers have also been installed.

The Cape Cod Canal

Although Cape Cod Canal will not be ready for navigation for nearly two months, it is announced that the cape is no longer entitled to that name, but is now an island, as the waters of Massachusetts and Buzzards bays met for the first time on April 21. Quite a little ceremony attended the removal of the last dyke, when all the officials of the company were present. The canal will be opened to vessels drawing not over 12 feet on July 4, this year.

The 300th anniversary of the landing of Capt. John Smith on Monhegan Island, off Hancock county, Me., is to be celebrated in August.



IN ANTICIPATION of the opening of the canal to commercial traffic, the Pacific Steam Navigation Co. has directed the establishment of a fortnightly service from Liverpool around South America. The route is to be from Liverpool to the east coast of South America, thence through the Strait of Magellan and up the west coast to Panama, and through the canal back to Liverpool. The first vessel plying in this service, the steamship Orcoma, is due to arrive at Balboa from south ports about July 3. If it should not be able to go through the canal within a few days after its arrival, it will sail for Liverpool by way of the Strait of Magellan, but as soon as available the canal route will be used for the home voyage. The Orcoma is a freight and passenger vessel of 11,376 tons gross burden.

The Luckenbach Steamship Co., with four steamers now plying regularly between San Francisco and Balboa, and six in irregular service along the Atlantic coast of North America, has been awaiting the opportunity to merge all ten into a regular line between San Francisco and New York. These are vessels of from 5,000 to 10,000 tons cargo capacity. Two of them, the J. L. Luckenbach and the San Mateo are under temporary charter to the Panama Steamship Line, plying between New York and Cristobal, but their charters will be revoked as soon as the canal is opened. The steamship Demara, due at Balboa from San Francisco about June 16, has been loaded with its cargo for Panama on top, so that if it can be put through the canal it can discharge its local freight quickly and proceed direct to New York with the bulk of its cargo. It is the present intention of the company to make Balboa, instead of Colon, its point of tranferring freight.

W. R. Grace & Co., now operating their Santa Clara, Santa Cruz, Santa Cecilia, and Santa Catalina, from New York to San Francisco around South America, will divert them through the canal as soon as possible. The Santa Clara, due to arrive from San Francisco on June 17, and allowed a week on its schedule for the discharge of cargo at Balboa, including about 4,000,000 feet of lumber for The Panama Canal, is chartered to go through the canal to New York. The same course, with less time for discharging at Balboa, is scheduled for the Santa Catalina, due at Balboa on July 3. The time for this line between New York and San Francisco is now about 60 days, around the continent; it is anticipated that, by the use of the canal, it will be cut to 20 days.

The local representative of the Salvador Railway Steamship Line, recently established between Salina Cruz, Mexico, and Balboa, calling at the principal Central American ports, will send its vessels through the canal as soon as possible, to discharge at Colon for transfer to Atlantic vessels. This company is operating the steamships Acajutla and Salvador, and a third vessel for this service is building in England.

The management of the Harrison Line has been keeping in touch with the canal situation and intends, as soon as possible, to divert through the canal the steamers now plying in its Magellan route, from Great Britain to ports on the Pacific coast of the United States and Canada. This firm also operates a Panama route, making Colon and transferring cargo by way of the Panama railroad to Pacific lines, and a Tehuantepec route, in which the service has been suspended on account of the troubled condition there; it is probable that the vessels of these routes may be diverted to the canal within a few months.

The American-Hawaiian Line, operating 26 steamships in Atlantic and Pacific trade, and already using the canal by having cargo lightered through, has advertised its intention of sending its vessels through the canal as soon as possible. This line has been using the Tehuantepec route. Its vessels will ply between New York, San Francisco, Seattle, and Hawaii.

First Earnings of Canal

Commercial use of The Panama Canal began on May 18, when three barges loaded with sugar diverted from the Tehuantepec route by the American-Hawaiian Steamship Company, left Balboa in tow for Cristobal. Since that time barges have been going through the Canal in tow more or less regularly, and will probably continue to do so as long as the car shortage exists, or until the Canal is permanently opened for the passage of ocean going vessels. The total earnings in Canal tolls on cargo and ballast tonnage from the date above mentioned until the end of the month is placed at $7,356.12, divided as follows:

	Tons.	Tolls.
On cargo handled from Balboa to Cristobal.....	3,276.00	$3,931.20
Cargo handled from Cristobal to Balboa.....	184.39	221.27
Ballast tonnage Cristobal to Balboa	2,494.71	2,993.65
Ballast tonnage on barge No. 14, Paraiso to Balboa	175.00	210.00
Total	6,130.10	$7,356.12

The only cargo handled from Cristobal to Balboa was a load of angle iron transported through the Canal on barge No. 15 on May 25. Under the existing arrangement, the Panama Railroal company is charged with all tolls, and, in addition, pays for towage, but the latter charge is confined as nearly as possible to actual cost. The charge for tolls on cargo tonnage is $1.20 per net ton of 100 cubic feet; the tolls collectible on the net ballast tonnage is 60 per cent of the net cargo tonnage charge.

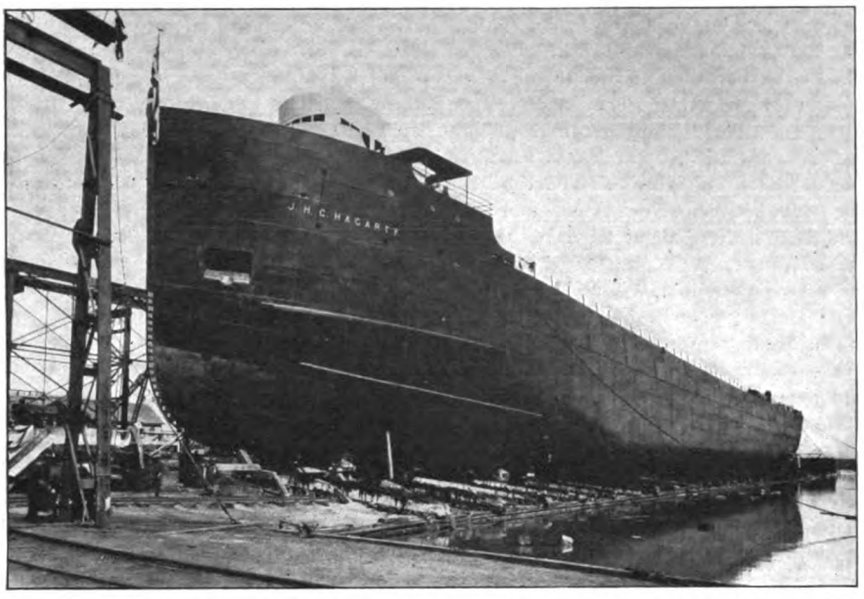
At the annual meeting of the William Cramp & Sons Ship & Engine Building Co., Philadelphia, the following officers and directors were reelected: Henry S. Grove, president; Harry W. Hand, vice president and general manager; Charles T. Taylor, secretary and treasurer; Roland L. Howe, assistant secretary; George H. Carey, assistant treasurer. The directors are H. A. Berwind, Samuel Dixon, Lincoln Godfrey, Henry S. Grove, Harry W. Hand, F. L. Hine, Charles E. Mather, George H. McFadden, William M. Potts, Carroll S. Smith and Albert Strauss.

The Marine Iron Works, Toledo, has received contract for installing four new boilers in the Don Juan de Austria.

Canadian Bulk Freighter

The J. H. G. Hagarty Built to Replace the Carruthers is a Very Staunch Vessel

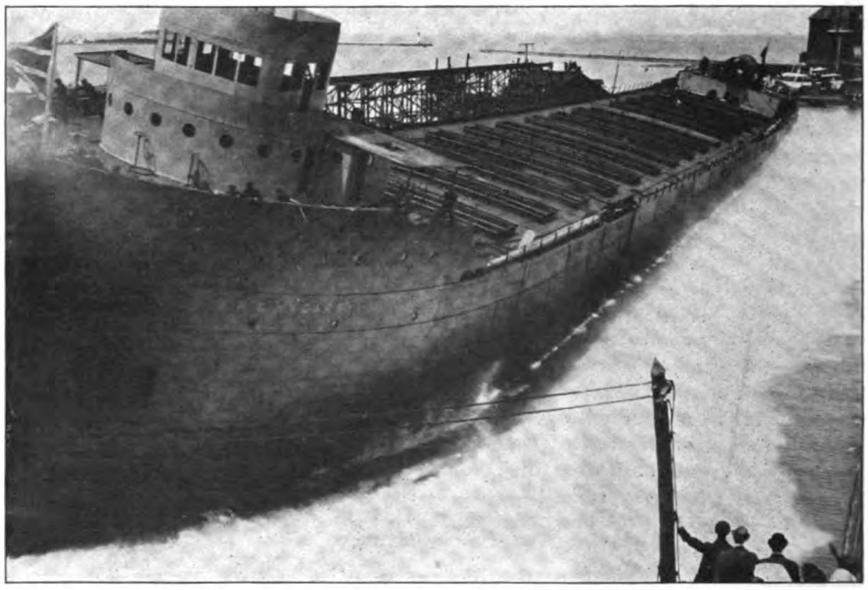
THE bulk freighter J. H. G. Hagarty, building for the St. Lawrence & Chicago Steam Navigation Co., was launched from the yard of the Collingwood Ship Building Co., Collingwood, Ont., on June 18, being christened by Mrs. Morton Jones of Toronto. This vessel is one of the largest type of side tank bulk freighters on the lakes, being 550 feet over all, 530-feet keel, 58-feet beam and 31 feet deep. She is built to the highest class in the Great Lakes Register, but as in previous vessels built for this company she is constructed greatly in excess of the requirements of the Great Lakes rules, the top side plating, stringer and gunwale bar being exceptionally heavy to withstand the longitudinal strains. The water bottom is 5 feet deep and the side tank, which is 5 feet wide, extends to the main deck stringer. The cargo hold is divided into six compartments. There are 16 hatches, 40 feet wide and 10 feet long, spaced 24 feet centers, fitted with 4-inch spruce covers secured in place by Mulholland hatch fasteners. These covers are fitted (salt water style) inside of Tyzacks patent hatch rest bars and will be supported underneath with portable steel strongbacks fitted both fore and aft and athwartship. In loading or unloading grain the strongbacks are not moved, but in loading or unloading coal or ore, they are slid out of the way.



THE BULK FREIGHTER J. H. G. HAGARTY ON THE STOCKS

The customary crew's, owner's and navigating accommodation is fitted forward and the deck houses are of increased strength and fitted with 16-inch circular deadlights. All doors in cabins, texas, etc., are of 2-inch solid teak with 6-inch high coaming on deck. In the after deck house are situated private and crew's dining rooms, galley, pantry, ice house, firemen, engineers' and other quarters. The engine room and galley skylights are of substantial design and made entirely of steel. The doors of the firehold and entrance to engine room are also of steel. The Hagarty has no hurricane deck roof over the fantail, the object being to give the sea no chance to get under and lift off the cabin.

The motive power is supplied by one triple-expansion engine having cylinders 24, 40 and 66-inch diameters by 42-inch stroke, jet condensing, supplied with steam by three Scotch marine boilers, 13 feet diameter and 11 feet long, working at 185 pounds pressure under forced draft, the whole being capable of developing about 2,400 H. P., giving a speed of 13 miles per hour loaded. A very complete installation of auxiliary machinery and pumps has been installed, and the pipes for handling all the water ballast are of large diameter in order to clear the tanks in as short a time as possible. Special attention has been given to the steering gear. The vessel has two separate independent steam steering gears—the Akers emergency gear on one side and main gear on the other, a special feature. The throttle of the main steering engines, which is direct-connected to rudder, is operated by Akers transmission. A one-ton refrigerating plant has been installed, together with the necessary cold chambers for carrying provisions for the crew.



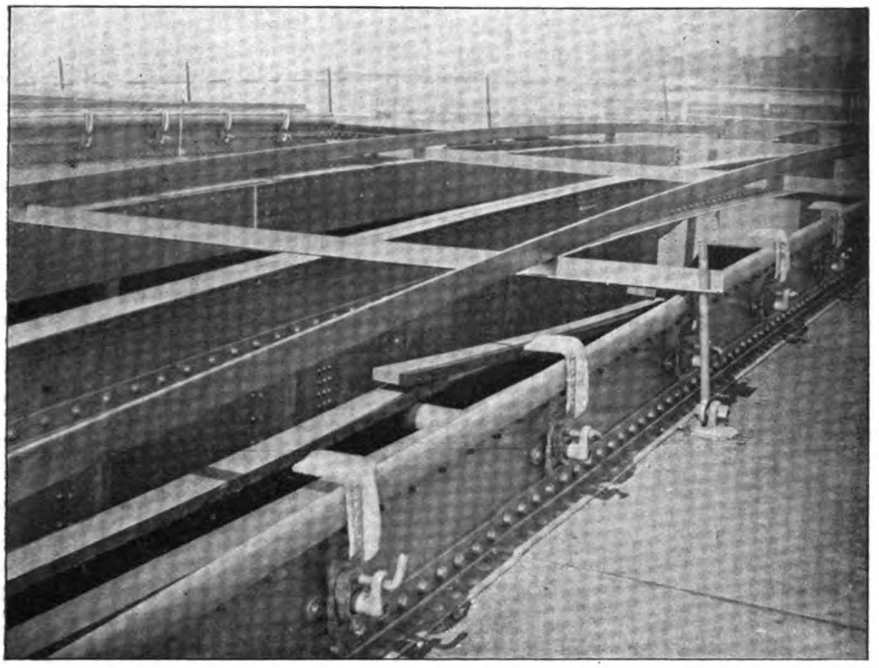
LAUNCHING THE BULK FREIGHTER J. H. G. HAGARTY AT THE YARD OF THE COLLINGWOOD SHIP BUILDING CO., COLLINGWOOD, ONT.

In this vessel the owners have spared no expense to make her the best of

her kind and to insure the greatest amount of safety possible. The keel was laid in the middle of November, 1913, and the vessel was delivered to her owners during the first week in July, a period of less than eight months for building.

After the launching luncheon was served to the launching party at the Globe hotel, at which Thomas Long presided. He entered a vigorous protest against the admission free of duty of what he called "worn out hulks" from the United States; also against the admission free of British-built ships, adding that the government gave all sorts of favors to the railways but had nothing but hard knocks for the shipbuilders.

Among those at the launching were: J. H. G. Hagarty and family, Mrs. Morton Jones, Mr. and Mrs. S. Casey Wood, W. H. Holland and son, George F. Harman, Dr. Spragge, Thomas Britt, Robert Kerr, M. Hodder, C. G. Marlatt, Mr. and Mrs. A. A. Wright, Mrs. Robert McKay, Capt. S. Crangle and party, A. St. G. Boulton, Temple Blackwood, Capt W. J. Basset, Capt. James B. Foote, Mr. and Mrs. Hugh Calderwood, Wilmot L. Matthews, Colonel D. R. Biscoe, Rev. J. S. Broughall.



HATCHES OF THE HAGARTY OPEN, SHOWING STRONGBACKS

Tonnage Certificates for Panama Canal

The following is a copy of circular No. 673 issued by the governor, Panama canal, May 26, 1914:

1. It is important that vessels which expect to use the Panama canal should provide themselves with the proper tonnage certificate, based upon the rules laid down for Panama canal measurement. The rules, regulations and laws which govern this measurement vary from those for similar measurement on the Suez canal and in the United States and foreign countries, and vessels require a remeasurement in order to conform to the Panama rules.

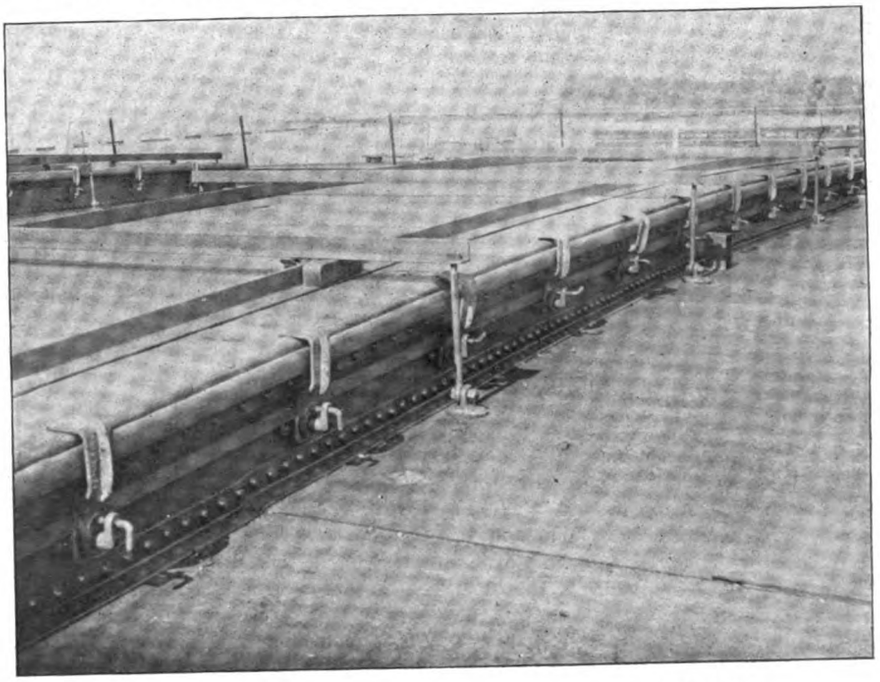
2. The collector of customs at New York, the collectors in some of the other large cities of the United States and certain properly designated officials abroad have been authorized to measure vessels under the Panama rules and issue the required certificate, and in order to avoid delay and measurement upon their arrival at the canal, it is strongly recommended that all vessels provide themselves with the proper certificate before their arrival in canal waters.

3. In case a vessel has failed to provide herself with the proper tonnage certificate, it will be of great assistance and save time if she be provided with a full set of blue prints of her plans and a copy of the measurements which were made when she received her tonnage certificate, and also the tonnage certificate itself.

4. Vessels which have the proper certificate will probably suffer no delay in transit, but those which are not so provided will be delayed until the proper measurements can be made.

5. Foreign vessels may be measured not only in their home ports, but also in the port of New York and probably in other large American ports, without any additional charge, but those desiring such measurement should give sufficient notice in advance and appoint a date when they will be empty so as to facilitate the measuring.

6. Under any conditions the canal authorities reserve the right to check and correct any measurement or certificate issued elsewhere.



HATCHES OF THE HAGARTY, SHOWING THE STRONGBACKS

The new double-leaf bascule bridge over the new United States ship canal at Sault Ste. Marie, Mich., has a span of 336 feet and provides a navigation clearance of 279 feet. The bridge was designed by the Strauss Bascule Bridge Co. of Chicago.

Sea Going Dredge San Pablo

Bids for the sea-going hydraulic hopper dredge San Pablo were opened at San Francisco on June 18. The principal dimensions of the San Pablo are: Length, 155 feet; beam, 35 feet; depth, 17 feet; capacity, 500 cubic yards; draught, loaded, 14 feet 7 inches. The bids received on government specifications, delivered builder's yard, were as follows: Seattle Construction & Dry Dock Co., Seattle, Wash., $294,000; Mare Island Navy Yard, Mare Island, Cal., $292,899; New York Ship Building Co., Camden, N. J., $265,000; Spedden Ship Building Co., Baltimore, Md., $249,819; United Engineering Works, San Francisco, Cal., $247,000; Union Iron Works, San Francisco, Cal., $241,000; Skinner Ship Building & Dry Dock Co., Baltimore, Md., $205,990. The Ellicott Machine Corporation, of Baltimore, was the only eastern firm which made a bid for San Francisco delivery, their bid being $229,400. The government's estimated cost of delivery from the east coast to San Francisco is $12,000, which would make the bid of the Ellicott Machine Corporation for delivery at its yard approximately $217,400.

New Steamship Mongara

On May 22 the steamship Mongara, a fine new twin-screw passenger steamship built by Swan, Hunter & Wigham Richardson, Ltd., at their Wallsend Shipyard for the British India Steam Navigation Co., Ltd., was taken out to sea and most successfully completed a long and exhaustive trial trip off the mouth of the River Tyne. Swan, Hunter & Wigham Richardson, Ltd., together with Messrs. Barclay, Curle & Co,. Ltd., have a number of important liners in hand for the British India Steam Navigation Co., and the Mongara is the eighteenth ship built by the two companies in recent years for the same owners.

During the trial trip the owners were represented by Capt. Hodgkinson, chief marine superintendent, and Capt. Isdale, his assistant, John Clark, chief superintendent engineer, while the builders were represented by their directors, W. Denton, C. S. Swan and Noel E. Peck. The engines and boilers have been built by The Wallsend Slipway & Engineering Co., and during the trial trip worked without a hitch and to the satisfaction of everybody concerned. A speed of 14½ knots per hour was attained on the measured mile, and under service conditions only a quarter of a knot less was maintained during a twelve hours' continuous run. These speeds were easily got and are considerably in excess of contract requirements.

The Mongara has been built to Lloyd's highest class and also in accordance with the requirements of the Board of Trade. Her leading dimensions are 464 ft. in length overall with a moulded breadth of 58 ft. and a depth of 36 ft. Her gross tonnage is 8,500 tons. The vessel is built with deep web frames and widely spaced pillars so as to leave the cargo holds unobstructed for the stowage of bulky cargoes. The vessel's hull is divided by nine transverse bulkheads, seven of which are watertight and extend to the upper deck.

The triple-expansion twin-screw engines are supplied with steam from five single-ended boilers working under Howden's forced draught. The two propellers have detachable bronze blades. One of the engine platforms gives access on the main deck to the refrigerating machinery, which has been supplied by Halsam's Engineering Co., of Derby. Immediately abaft of the refrigerating machinery are cold storage chambers for vegetables, fish, meat and ice. Close to them are other insulated rooms for bonded wines, spirits and stewards' stores.

On the flying bridge of the Mongara is the captain's cabin adjoining the chart room. The living accommodation on the boat deck is devoted to the officers and engineers together with two telegraphists for the wireless apparatus and also cadets.

On the promenade deck at the after end are the second class smoking-room and lounge, both of which are most comfortably furnished and have large square windows on all sides. Below the promenade deck is the bridge deck amidships containing very comfortable accommodation for both first and second class passengers, the remainder of the staterooms being on the upper deck amidships. There is ample room in all for about 80 first class and 50 second class pessengers. A very noticeable feature in the ship is that the cabins are so arranged that all the inside rooms have direct air and light from a port hole in the side of the ship. This ingenious arrangement is due to Lord Inchcape, the chairman of British India Steam Navigation Co. On the upper deck abaft of the engine casing is the second class dining saloon handsomely furnished in polished mahogany, the walls being white relieved by a mahogany dado. At the forward end of the first class accommodation on the upper deck is found the first class dining saloon with seating for 86 passengers. The room is arranged with small tables surrounded by comfortable arm chairs. All the furniture is of light oak. The walls of the saloon are finished in white, relieved by panels which are decorated with dainty oval plaques of Wedgewood design.

On the upper deck in the after end of the ship is accommodation for the sailors, firemen, and servants. The petty officers have their quarters in the forecastle.

The chief weather decks of the Mongara are sheathed with teak planks. Special attention has been paid to the cargo gear. In addition to a large number of steam winches two steam cranes have been installed, and besides the usual derricks a heavy one is fitted on the foremast to lift 30 tons. The electrical equipment of the ship provides lighting in all quarters and also electric radiators and ventilating fans in all living accommodation. Double awnings are stretched over the flying bridge, boat deck, upper deck and poop.

Items of General Interest

The Polson Iron Works, Toronto, Ont., recently launched two lighters for the Hudson Bay Terminal.

A new bucket dredge, capable of removing 1,000 tons of material in an hour, recently arrived at Quebec to engage in work on improvement of that port. She crossed the Atlantic under her own steam.

The steamer Princess Margaret, building for the Pacific coast service of the Canadian Pacific, was launched at Dumbarton, Scotland recently. She is a 6,000-ton steamer and will be ready to leave on her maiden voyage about Sept. 1.

Frank A. White has just been appointed Lloyds agent at Victoria, B. C., to succeed John Waterhouse. Mr. White has had many years' experience in the shipping business, and Victoria is one of Lloyds most important stations in Canada.

The Atlas Shipping Co., Ltd., has been incorporated in Ottawa, Ont., with a capital of $250,000 to carry on business as shipbuilders in Montreal. The incorporators are Edwin Howard, Jacob DeWett, Henry C. McNeill, all of Montreal, Que.

The Great Lakes Dredging Co. has received contract for dredging out 35 acres of land on the south side of the Kaministiquia river, Fort William, above the Grand Trunk bridge, for a turning basin. Work will be begun immediately.

The Northern Navigation Co., Ltd., Collingwood, Ont., has painted the piles of the docks at all of its ports of stoppage identically the same fashion as the funnels of their steamers, consisting of red, white and black stripes. As an advertising feature, this has proved very attractive.

Captain L. A. Demers has been ap-

pointed wreck commissioner of the port of Montreal, having resigned his position as harbormaster of that port. Capt. T. Bourassa, deputy harbor master, will be promoted to the position of harbor master, to succeed Capt. Demers, and Lieut. James F. Symons, who for the past year and a half has acted as assistant harbor master at Montreal, will succeed Capt. Bourassa as deputy harbor master.

T. E. Dalrymple, vice president of the Grand Trunk railway, and George Smithers of Burnett & Co., brokers, have been appointed directors of the Canada Steamship Lines, Ltd.

The new steamer Messanabi, building for the Canadian Pacific Atlantic service, was launched at Glasgow on June 20 at the yard of Barclay, Curle & Co. Her sistership, the Metagama, will be launched in the near future. These vessels are twin-screw steamers of 13,000 gross tons capacity and have cruiser sterns.

The Collingwood Ship Building Co., Collingwood, Ont., has received contract from the Dominion government for the construction of a steam hopper barge to cost about $160,000. The boat will be 165 feet long, 35-foot beam and 14 feet deep. She will be constructed of steel throughout and will be propelled by powerful engines of 800 horsepower.

Combination of British Lands

An important arrangement has just been concluded whereby an exchange of shares is affected and a community of interests ensured between two powerful shipbuilding and repairing companies of world-wide reputation. The firms in question are Swan, Hunter & Wigham Richardson, Ltd., of Wallsend & Walker-on-Tyne and H. & C. Grayson, Ltd., of Liverpool and Birkenhead. The Tyneside works of Swan, Hunter & Wigham Richardson, Ltd., cover seventy-eight acres and include shipyards at Wallsend and Walker, the Neptune Engine & Boiler Works at Walker, and the Drydocks Department at Wallsend, comprising two graving docks and two floating docks.

Last year, as is well known, they effected an exchange of shares with Barclay, Curle & Co., Ltd., shipbuilders and engineers of Whiteinch, Glasgow, whose works include the Clydeholm Shipyard at Whiteinch, the Stobcross Engine & Boiler Works, Glasgow, the Clydeside Repairing Works at Govan, and the Elderslie Shipyard and Graving Dock at Scotstoun West.

Swan, Hunter & Wigham Richardson, Ltd., also have a large interest in the well-known Wallsend Slipway & Engineering Co., Ltd., of Wallsend, and in Harris Bros., Ltd., owners of the two Cambrian Drydocks at Swansea.

H. & C. Grayson, Ltd., are one of the oldest firms of the kind in Great Britain, their business dating as far back as 1765. They are owners of graving docks, slipways and repairing works at Liverpool, Garston and Birkenhead. All these works are thoroughly modern as regards buildings, plant and machinery, and they are capable of dealing with all classes of repair work of the heaviest description. H. M. Grayson, the principal of the company is also a director of Clover, Clayton & Co., Ltd., of R. & H. Green and Silley, Weir, Ltd., London and of Jos. T. Eltringham & Co., Ltd., Willington-Quay-on-Tyne.

The management of the three enterprises at Wallsend, Liverpool and Whiteinch remains the same as before. It will be satisfactory to the customers of the various companies to know that when either shipbuilding or repair work has to be placed on the west or east coast of the United Kingdom, an advantageous continuity of supervision is at their command. Furthermore, they have the knowledge that the very wide experience of the firms in question, the services of their highly trained staffs and the best of modern machinery and plant will ensure all work entrusted to them being carried out in the most efficient and economical manner possible.

Ship Building During May

The Bureau of Navigation, Department of Commerce, reports 127 sailing, steam, and unrigged vessels of 20,052 gross tons built in the United States and officially numbered during May, 1914, as above.

	Atlantic and Gulf.		Porto Rico.		Pacific.		Hawaii.		Great Lakes.		Western Rivers.		Total.	
	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.	No.	Gross.
WOOD:—														
Sailing	1	8	..	...	..	.....	..	...	..	.....	.	...	1	8
Steam	47	1,097	..	...	25	949	..	...	10	620	8	67	90	2,733
Unrigged .	11	2,124	..	...	6	242	..	...	1	50	.	...	18	2,416
Total	59	3,229	..	...	31	1,191	..	...	11	670	8	67	109	5,157
METAL:—														
Sailing	2	184	..	...	..	.....	..	...	..	.....	.	...	2	184
Steam	6	1,851	..	...	..	.....	..	...	3	9,062	3	287	12	11,200
Unrigged ..	2	2,065	..	...	..	.....	..	...	2	1,446	.	...	4	3,511
Total	10	4,100	..	...	..	.....	..	...	5	10,508	3	287	18	14,895
TOTALS:—														
Sailing	3	192	..	...	..	.....	..	...	..	.....	.	...	3	192
Steam	53	2,948	..	...	25	949	..	...	13	9,682	11	354	102	13,933
Unrigged ..	13	4,189	..	...	6	242	..	...	3	1,496	.	...	22	5,927
Grand total	69	7,329	..	...	31	1,191	..	...	16	11,178	11	354	127	20,052

The largest steel steamers included in these figures are:

Name of vessel.	Gross.	Where built.	Name of owner.
William D. Crawford.....	6,385	Lorain, Ohio	Virginia S. S. Co.
South American	2,662	Ecorse, Mich.	Chicago, Duluth & Georgian Bay Transit Co.

The steamer Kelley Island, building for the Kelley Island Lime & Transportation Co. at the Lorain yard of the American Ship Building Co., will be launched during the present month.

Ferryboat "Mayor Gaynor"

The screw-propelled ferryboat, Mayor Gaynor, for the Department of Docks and Ferries of the City of New York, has just been completed at the yards of the builders, the New York Shipbuilding Co., of Camden, N. J.

The principal dimensions of the vessel are as follows: Length over all, 231 ft.; moulded beam of hull, 45 ft.; beam over guards, 64 ft.; depth, moulded, to main deck, 18 ft. 6 in.

The ferryboat is of the double-decked type, with steel hull and casings and wood cabins. The hull is divided by five transverse steel watertight bulkheads in such manner that the vessel will remain afloat with any one compartment flooded.

The cabins on the main deck, for men and for women, respectively, are ornamented by panels. The seats are arranged longitudinally either side of each cabin, with life preserver stowage above, as is the usual practice.

Oak stairways lead from main deck to the saloon deck cabin. This upper cabin is finished inside to top of window rail in tongued-and-grooved oak, with paneling above. Here both longitudinal and transverse seating is installed to provide for maximum accommodation. Around the saloon deck house there is a considerable walking space ,and seats are built along the cabin sides. Toilets for the passengers are provided. The vessel is fitted with four metallic life boats about 20 ft. long, with one life raft and one life float, in addition to about 1,200 life preservers.

The ship is driven by one four-cylinder triple-expansion engine, 21½ in., 33 in., 39 in., 39 in. by 30-in. stroke, which is supplied with steam

by three Babcock and Wilcox water-tube boilers, working at 225 lbs. pressure. The shafting is continuous from end to end of the vessel with a propeller on each end. Coal is used for fuel, the bunkers being located in each wing of the boiler space. Two stacks are provided. The specified speed for this vessel is 14 statute miles per hour, which was exceeded with ease on a recent trial.

Elected General Manager

Alfred G. Smith was elected general manager of the American Ship Building Co. at a meeting of the board of directors held on Wednesday, June 17. Mr. Smith served his apprenticeship in the yard of the Globe Iron Works, Cleveland, under the direction of his father, who was one of the pioneer lake ship builders, and at

ALFRED G. SMITH

that time superintendent of the Globe yard. He entered the Globe yard in 1886. His experience has not been wholly confined to hull construction, having served in the machinery department with Walter Miller during the construction of the Great Northern Steamship Co.'s steamers North Land and North West. After serving in the drafting department of the Globe yard, Mr. Smith was appointed foreman of hull construction at Lorain in 1898, remaining there until 1901, when he was appointed superintendent of the Buffalo Dry Dock Co. In 1902, he was made general superintendent of the Chicago Ship Building Co., which office he held until 1908, when he resigned to go into business for himself as a naval architect. It will be seen that he has been actively associated with the construction of all types of lake vessels since boyhood.

Olympic Larger Than Aquitania

Shipping men and trans-Atlantic travelers on both shores of the big pond are talking of the latest surprise in marine circles—the official figures just issued at Lloyds showing that the White Star steamer Olympic is entitled to the distinction of being called Britain's largest liner, because she is 712 tons larger than the Cunarder Aquitania. It always has been an established rule of the sea that the vessel having the greatest tonnage is considered the largest, and the following comparisons of these two steamers will be found most interesting:

	Olympic	Aquitania
Gross tonnage	46,359	45,647
Underdeck tonnage	35,043	28,408
Net tonnage	22,350	21,993
Length	882 ft. 6 in.	901 ft. 0 in.
Beam	92 ft. 5 in.	97 ft. 0 in.
Depth	59 ft. 5 in.	49 ft. 7 in.

The Olympic and the White Star's newest leviathan, Britannic, now under construction, which is 50,000 tons gross register, are the two largest British steamers.

Navigation in Fog

Whenever a terrible accident occurs people rush into print with all sorts of foolish suggestions. It was so after the Titanic disaster and is so after the Empress of Ireland disaster. But once in a while a suggestion is made that does seem to have many practical elements about it. For instance, a correspondent in a Liverpool contemporary has suggested that had the boats of both the Empress of Ireland and the Storstad been cleared for lowering, though not swung out, the probabilities are that a far greater number of lives would have been saved. His suggestion is that it should be a rule that all the passenger lines should during fog make a point of mustering the boat's crew and have all the boats cleared for lowering so that they might in case of accident be put in the water, providing weather conditions permitted. And, furthermore, he urges that during fog in smooth water would be a good time for boat drill, and this would serve the purpose of being ready for anything that might happen while at the same time causing no alarm to passengers.

The Alexander Seaman's Bill

By a unanimous vote the house committee on merchant marine reported the LaFollette Seamen's Bill, but so changed in form that it will henceforth be known as the Alexander bill. Representative Alexander attended the recent conference in London and practically redrafted the measure in accordance with the conclusions of that conference. The life boat provisions have been amended so that boats operating on courses five miles from shore must carry a complement of life boats and rafts to accommodate 50 per cent of the licensed passenger capacity. Of this number of rafts and boats, two-fifths may be in life boats and three-fifths in rafts. The provision requiring two able seamen for each boat has been so amended that they may be drafted from any department of the crew. Lake freighters which go on trips of more than 13 hours between ports are required to carry a full life boat equipment to accommodate everybody on board. Lake bulk freighters now carry life boat equipment for practically double the number of the crew.

There is one provision in the bill, however, which will give steamship owners operating passenger boats on the lakes some trouble, and that is the provision that all lake passenger vessels built after July 1, 1915, must be constructed after a new type in order to comply with the proposed law, since all such vessels will be required to carry a full complement of life boats to accommodate every passenger. The superstructure of the side-wheelers on the lakes is such that the boat deck could not sustain any such weight as is here contemplated. It will be necessary to build another kind of ship altogether and one that probably could not be operated profitably at present rates.

Gen. Garret J. Lydecker, who had charge of many important improvements on the lakes, died at his home in Detroit on Thursday. He was assigned to the lakes in 1878 and had charge of the original survey for improving St. Clair river and building the St. Clair Flats canal. He supervised the completion of the Poe lock at the Sault. His latest assignment was the improvement of the Detroit river. He retired in 1907.

The port of Astoria commission has received the following bids for dredging the harbor of Astoria, Ore.; Standard American Dredging Co., Oakland, Cal., $202,500; Puget Sound Bridge & Dredging Co., $206,250; Guthrie-McDougel Co., $212,500; Tacoma Dredging Co., $186,250.

AROUND THE GREAT LAKES

The new steamer Howard M. Hanna Jr., built at the Cleveland yard of the American Ship Building Co. for W. C. Richardson & Co., left for her maiden trip up the lakes July 6.

Capt. Fred J. Trotter of the Trotter Towing & Wrecking Co., Amherstburg, Ont., is salving the machinery from the steamer City of London, sunk on Pelee, Middle Ground, Lake Erie.

The steamer I. W. Nicholas, which went ashore at North Point, Lake Huron, last November, has been cut down to a Canadian canal size steamer by the Reid Dry Dock Co. and has been sold to Canadian interests.

The steel steamer William Henry Mack, of the Jenkins Steamship Co.'s fleet, has been sold to Canadian interests through the Duluth Shipping Co. The Mack was built in 1903 and is 354 feet keel, 48 feet beam and 28 feet deep.

The license of Capt. George H. Burnham, master of the steamer Caldera, which sunk the steamer Gilbert below Thunder Bay Island, Lake Huron, on May 22, has been revoked. Capt. Charles S. Ellis has been appointed master of the Caldera.

The Northwestern Fuel Co. at Superior has awarded the contract for building a 700-foot unloading bridge at its No. 1 dock to the Heyl-Patterson Co., Pittsburgh, at $100,000. The equipment will consist of 12-ton buckets and the rig will be electrically operated. It replaces the one that was destroyed by high winds.

The sand sucker Kelly Island was launched at the Lorain yard of the American Ship Building Co. on June 17. This vessel is building for the Kelley Island Lime & Transport Co. of Cleveland and is 175 feet long, 38 feet beam and 18 feet, 6 inches deep. The craft is self-propelling, having fore and aft compound engine, 20 and 40-inch cylinder diameters by 30-inch stroke.

The steamer Howard M. Hanna Jr. which was wrecked in Lake Huron in the big storm last November has been purchased by the Reid Wrecking Co. of Port Huron. The Wrecking company had made a contract with the underwriters to float the Hanna and deliver her in port for 65 per cent of the value of the ship, and has now purchased the 35 per cent held by the underwriters.

The Great Lakes Transportation Co. which purchased the Minnetonka and Minnekahta from the Chicago & Duluth Transportation Co. and the Wawatam from the Pittsburgh Steamship Co. has renamed them respectively Glenfinnan, Glenlyon and Glenlivet and has transferred them to Canadian register with headquarters at Midland.

The Gulf & Lake Navigation Co. has taken over the business and vessels of the Farrar Transportation Co. of Collingwood, Ont. Under the terms of the offer the Farrar Co. is to receive $125,000 in cash, $250,000 7 per cent cumulative preferred stock and a bonus in common stock of $125,000. In other words, the new company will take over the Farrar stock at $110 per share.

The record for carrying the largest cargo on the Great Lakes now belongs to the steamer Willian Grant Morden, of the Canada Steamship Lines, Ltd. On June 15 this steamer loaded 12,606 gross tons, or equivalent to 14,119 net tons of ore at Escanaba and delivered it at Port Colborne. The steamer was drawing 19 feet 8 inches forward and 19 feet 11 inches aft.

J. H. Cooke, superintendent of the Northern Pacific ore dock at Superior, and W. J. Benson, superintendent of the Duluth-Superior interstate bridge, have organized a company to be known as the Universal Flashlight Signal Co., which will manufacture electric flashlights to be attached to steamboats in such a manner that a cluster of lights will show at the masthead when the whistle is blown. An experimental outfit has been installed on the steamer St. Clair.

The American Ship Building Co. last week decided to make no further contest of the Commonwealth Steamship Co.'s case but will take back the steamers Abraham Stearn, J. Q. Riddle and Sheldon Parks, assuming the outstanding bonds and paying the stockholders of the Commonwealth Steamship Co. the amount of money mutually agreed upon. The three steamers will be purchased from the ship building company by the Scott Steamship Co., which will be an Ohio corporation with a capital stock of $600,000, and of which D. R. Hanna will be president, R. L. Ireland, vice president, Matthew Andrews, vice president, and J. S. Ashley, secretary and treasurer. The steamers will be operated by M. A. Hanna & Co. It is understood that the ship building company is not a loser in the transaction. The steamers will be renamed. One of the boats will be renamed in honor of J. J. Turner, first vice president of the Pennsylvania Railway Co., but the other names have not been decided upon.

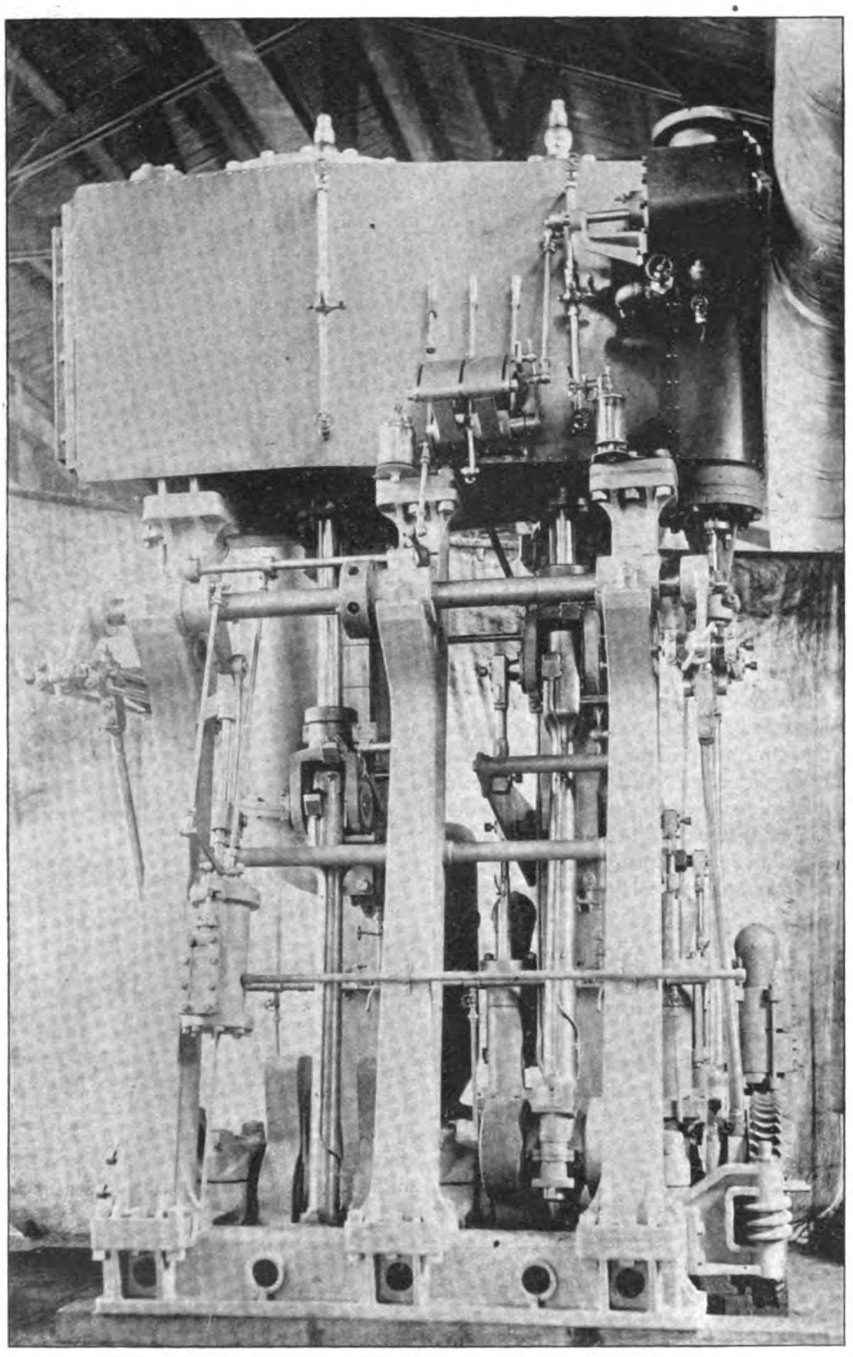
Sanitation in Lake Vessels

The Welfare Plan Committee of the Lake Carriers' Association held a meeting in the office of J. H. Sheadle, vice president, July 8, and reviewed in general the work of sanitation which was started by the committee last spring. Circulars were sent to all of the supply houses defining the manner in which foodstuffs should be kept, and circulars were also sent to the vessels outlining certain essential features of the campaign. The reports indicated that the supply houses in general were endeavoring to conform to the conditions embodied in the circular and that improvement was visible.

Some discussion was had on the care of the refrigerator aboard ship and it was of the opinion that under no circumstances should meat or provisions be stowed in the refrigerator by anyone except the steward and that they should be stowed in such a way that single pieces of meat could be got at without the necessity of handling any other piece. The captain will be expected to bring this matter to the attention of the steward.

Erie Railroad Tug Alice Stafford

The Erie railroad has recently placed in commission in Chicago harbor a second steel tug, the Alice Stafford, for handling its line steamers, car floats and lighters. The Stafford is practically a duplicate of the Frederick U. Robbins, for the same owner, which was placed in commission in August last and was described in MARINE REVIEW July, 1913. Both were built by the Manitowoc Ship Building & Dry Dock Co., Manitowoc, Wis.



ENGINE OF ERIE RAILROAD TUG ALICE STAFFORD—FRONT VIEW

The only essential difference is found in the machinery equipment. The main engines in the Stafford are by the Manitowoc company, while those of the Robbins are by another builder. The engines of the Stafford, of which we present two views, are from new designs prepared to the specifications of Babcock & Penton, Cleveland and New York, who also prepared plans and specifications for both tugs. The engines have cylinders 17 inches and 36 inches by 30 inches, designed for a working pressure of 150 pounds. All pumps are attached, contrary to general tug practice. The same plan was followed in the case of the Robbins and found extremely satisfactory. The air pump is 22 inches by 10 inches. The propeller is fourbladed, sectional, 9 feet 6 inches diameter, 11 feet pitch.

The use of buckwheat anthracite as fuel was found so completely satisfactory in the Robbins that it is also adopted in the Stafford.

Both tugs have a working draft with full bunkers of about 7 feet forward and 13 feet aft, and are said to be the most powerful as well as most economical in Chicago harbor.

Both are fitted with fire-fighting appliances, including large turret nozzles and special fire pumps, the hose equipment being Chicago fire department standard and designed to work in conjunction with the department's fire boats and engines.

Lloyds' Register of American Yachts

The publication of Lloyds Register of American Yachts for 1914 calls to mind the interesting fact that it is just 40 years since the first attempt was made to establish an annual record of this kind in America. The American Yacht List, as the little book was called, was "published with the official sanction and under the patronage of the New York Yacht Club," by the late Neils Olsen, then steward and for many years after superintendent of the club. It was hardly more than a pamphlet, 5x7 inches, with but 145 pages and five rather crude color plates of club burgees. Though like Lloyds Register today, it included Canada with the United States, the total number of clubs listed was but 36, including the New York Canoe Club and two model-yacht clubs. The total number of yachts listed was 507, of which 21 were entered as "screw steamers", though most of these were very small launches. A typical steam yacht of the day was the Day Dream, built in 1871 for the late William H. Aspinwall, a wooden craft of 70 tons, 115 feet over all; 109 feet length water line; 19 feet wide and 7 feet depth of hold; no draft and no particulars of the engine being given. All the yachts were of wood with a single notable exception, the iron cutter Vindex, designed by A. Cary Smith for Robert Center, the first American cutter, the first iron yacht and the first yacht built from a design on paper instead of from the wooden block model.

How yachting has flourished in this period may be judged from the American Yacht Register of today, a substantial book 7½ x 9 inches, with 513 pages and 49 color plates, listing a total of 3,564 yachts, 544 yacht clubs, and 36 yachting associations or other organizations connected with the sport.

The old schooner America, which by chance did not appear in the little

book of 1874, being then a vessel of the United States Navy, is still in Lloyds, almost alone in point of age, but with her are the three defenders of the cup which she won: Resolute, Defiance, and Vanitie. Another notable new yacht is the schooner Katoura, owned by Robert E. Tod, designed and built by the Herreshoffs to Lloyds rules for the International racing classes and already spoken of as a possible challenger for the American Cup in the event of the victory of the challenging Shamrock IV.

The changes of this year are, first, the passing of many wooden yachts of the Burgess era; second, the addition of new cruising yachts of large size propelled by gasoline engines, and third, the very large number of small raised-deck cruisers, the family launch that is meeting with such well-deserved popularity on inland as well as coastal waters.

How many yacht clubs exist today within the limits of the States, Canada and the West Indies is a question that cannot be definitely answered; the records of Lloyds show between six and seven hundred under the varying titles of yacht, launch, power boat and motor boat clubs; many of these, small and of recent origin, are difficult to locate, but the full particulars, including location, entrance fees and dues, names of officers and addresses of secretary, are given for 544 clubs. The color plates include, in addition to the various national ensigns and the Signal Code and Weather Bureau flags, the burgees of 587 clubs and associations and the private signals of 1920 yachtsmen.

Eight years ago it was found necessary to increase the size of page of the American Yacht Register to accommodate the rapidly increasing number of yachts and yacht clubs; this year the book has been entirely reset in a slightly smaller but no less legible type, in order to give space for the very full particulars of both hulls and engines which are demanded by yachtsmen, at the same time a change has been made to a thinner paper of equal quality in order to keep the volume within reasonable limit of size and weight.

The book is published by Lloyds Register of Shipping, 17 Battery Place, New York City.

Relative Native Strength

The Office of Naval Intelligence in the Navy Department at Washington has published a chart showing by a series of tables the relative sea strength of the great naval powers of the world. The United States continues to stand third, and the table of ships built or building credits Great Britain with 72, Germany with 39, the United States 36, France 29, Japan 19, Russia 15, Italy 17, and Austria 10.

The relative order of warship tonnage, including all types of vessels, as disclosed by the chart, is as follows:

Present Order (Tonnage Completed.)—Great Britain, 2,052,711 tons; Germany, 943,338; United States, 760,002; France, 645,891; Japan, 497,199; Russia 283,681; Italy, 259,136; Austria, 198,351.

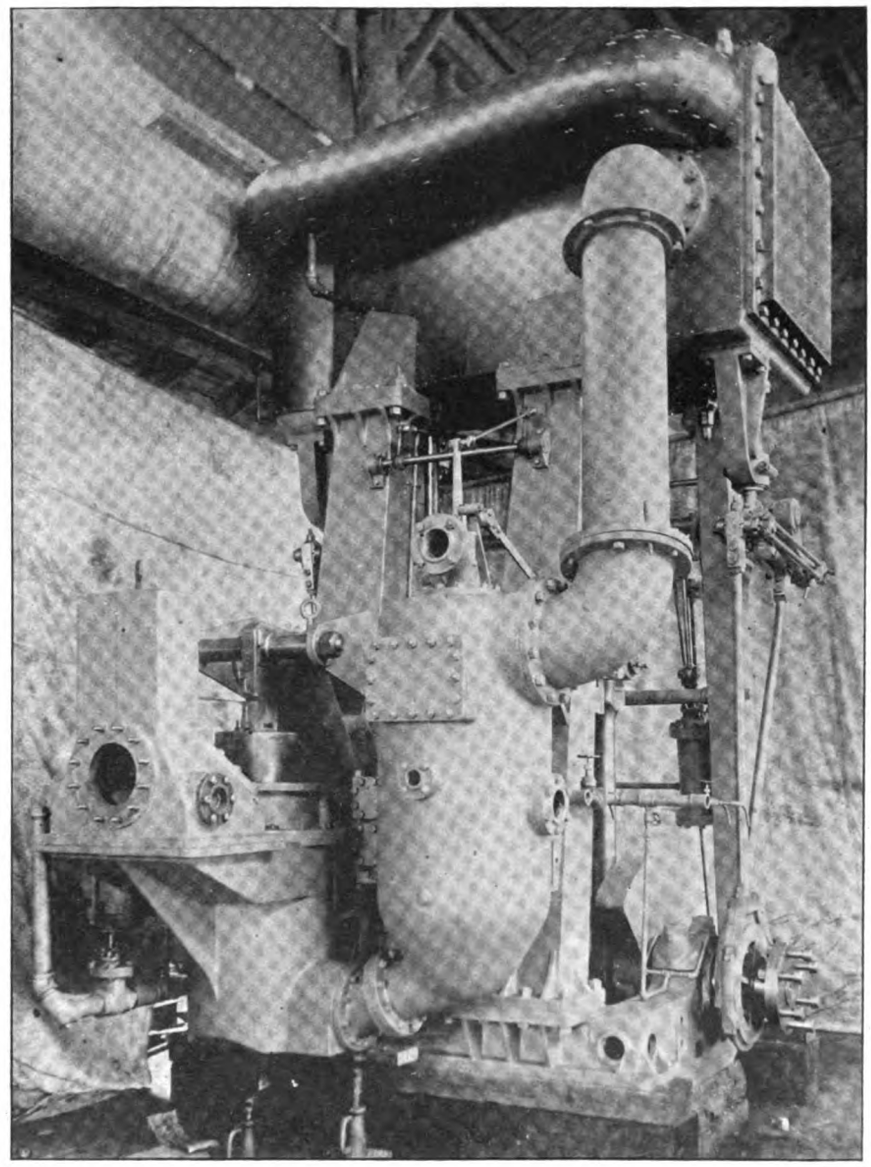
As Would be the Case if Vessels Now Building Were Completed.—Great Britain, 2,591,291 tons; Germany, 1,228,208; United States, 921,844; France, 876,155; Japan, 702,099; Russia, 685,373; Italy, 452,089; Austria, 258,740.

The following vessels were not included in the tables:

Ships over 20 years old from date of launch, unless they have been reconstructed and rearmed within five years; torpedo craft over 15 years old; those not actually begun or ordered, although authorized; transports, colliers, repair ships, torpedo depot ships or other auxiliaries; vessels of less than 1,500 tons, except torpedo craft, and torpedo craft of less than 50 tons.

England maintains her ascendency over the two next powers in personnel as in ships. She has a total personnel, officers and men, navy and marines, of 145,553, as against 73,396 for Germany and 63,859 for France. The United States stands fourth in total personnel, the figures being 63,413 on Dec. 1. Russia is next with 50,425, Japan with 49,435, Italy with 37,101, and Austria with 20,574.

Of warrant officers, England has 2,693; Germany, 2,686; United States, 867; France, 139; Japan, 1,553; Rus-



ENGINE OF ERIE RAILROAD TUG ALICE STAFFORD—REAR VIEW

sia, none; Italy, 1,136, and Austria, 388.

In enlisted men, England has 115,208; Germany, 60,920; United States, 49,854; France, 60,505; Japan, 43,847; Russia, 47,318; Italy, 33,864, and Austria, 18,712.

In enlisted marines, England has 21,033; Germany, 5,597; United States, 9,921.

Japan is strong in flag officers, having a total of 67, ranking next to Great Britain with 93. Japan boasts of 3 admirals of the fleet, 8 admirals, 18 vice admirals and 38 rear admirals. The United States has 1 admiral of the navy and 25 rear admirals. Germany has a total of 40 flag officers, including 2 admirals of the fleet. France a total of 45 (no admirals). Russia 54, Italy 33 (1 admiral), and Austria 14 (1 admiral).

Russia rates 85 chaplains, ranking next to Great Britain with 151. Germany has 28, the United States 24, and Austria 12. Japan evidently believes that the sword is mightier than the prayerbook, for she ranks second in officers of flag rank, but has no chaplains. France and Italy also have no spiritual pilots.

Cost of Ship Building

H. E. Moss & Co., Liverpool, Eng., have just issued their semi-annual steamship circular in which they comment on the general situation as follows:

"Since the issue of our last semi-annual circular, steamship owners have had to face one of the most sudden periods of depression experienced for a very long time past. Fortunately, the majority have profited so well during the last few years that they should have enough reserves put by to tide over the bad time through which they are now passing. The boom recently experienced could not be expected to continue much longer, but we consider everything is presently at about the lowest ebb, and there is not much room for further depression. Our own opinion is that during the coming autumn, by which time it is to be hoped the present political unrest, at home and abroad, will be in a fair way of settlement and the new crops also will have to be moved, we shall see a gradual improvement in freights and better prospects for shipping, especially as financial conditions are also improving.

"The passenger trades from Europe to the United States during the present season for first-class passengers seem fairly promising, most of the fast liners are booked well ahead, but the number of emigrants is not what was expected, and there is plenty of room for improvement. The conferences recently held between the representatives of the leading lines have not yet led to a definite agreement as to the future, but we sincerely trust that a mutual understanding will soon be arrived at to avoid any unwise cutting of rates, which would otherwise naturally result.

"The effect of the expected opening of the Panama canal on Jan. 1, 1915, is as yet an unknown quantity, owing to the difficulties the United States government is presently experiencing in its completion. We sincerely hope they will be overcome in time to enable shipowners to profit by the great developments that will naturally result.

"The tonnage under construction at the present time is much less than that on Jan. 1 last, and mainly consists of war ships and steamers for special trades. The amount of tramp tonnage is comparatively small, and few orders are being placed for vessels of this description.

"Our board of trade returns, although showing an enormous volume of business, do not continue to expand to the extent they did during the last few years, for undoubtedly high-water mark has been passed, but, nevertheless, they prove that the amount of trade going on must be still very large.

"The cost of building new steamers during the last 12 months has declined about 10 per cent, mainly through the reduction in price of material and competition between the builders, but we do not see that prices can be reduced much more, seeing that wages remain high, with little prospect of their being any reduction for some time to come.

"There are very few boats presently building for sale, and any that have recently been sold have had to be disposed of at much lower prices than previously obtained. Second-hand steamers are being offered for sale in larger numbers, but with few buyers, and owners have had to accept considerably reduced prices.

"The improvements in naval architecture made by shipbuilders and engineers at home and abroad during the time under review have been still further remarkable, as proved by the splendid results of the latest Cunarder Aquitania, which exceeded all expectations in consumption of fuel, speed and stability.

"The demand for oil fuel continues to greatly increase, and its consumption is expanding in every direction, large quantities being now used by all the principal governments of the world."

Discontinuing Port and Starboard

The order of Secretary Daniels of the navy that the terms "helm", "starboard" and "port" shall be discontinued in the navy in instructions to the steersmen governing the movements of the rudder is as follows:

Orders governing the movements of the rudder:

1. This order supersedes general order No. 30, of May 5, 1913, which should be marked "canceled" across its face.

2. The term "helm" shall not be used in any command or directions connected with the operation of the rudder; in lieu thereof the term "rudder" shall be used—standard rudder, half rudder, etc.

3. The commands "starboard" and "port" shall not be used as governing the movement of the rudder; in lieu thereof the word "right" shall be employed when the wheel (or lever) and rudder are to be moved to the right to turn the ship's head to the right (with headway on) and "left" to turn the ship's head to the left (with headway on). Instructions in regard to the rudder angle shall be given to the steersman in such terms as "handsomely", "ten degrees rudder", "half rudder", "standard rudder", "left handsomely", etc. The steersman should afterward be informed of the new course by such terms as "course—135 deg."

Josephus Daniels,
Secretary of the Navy.

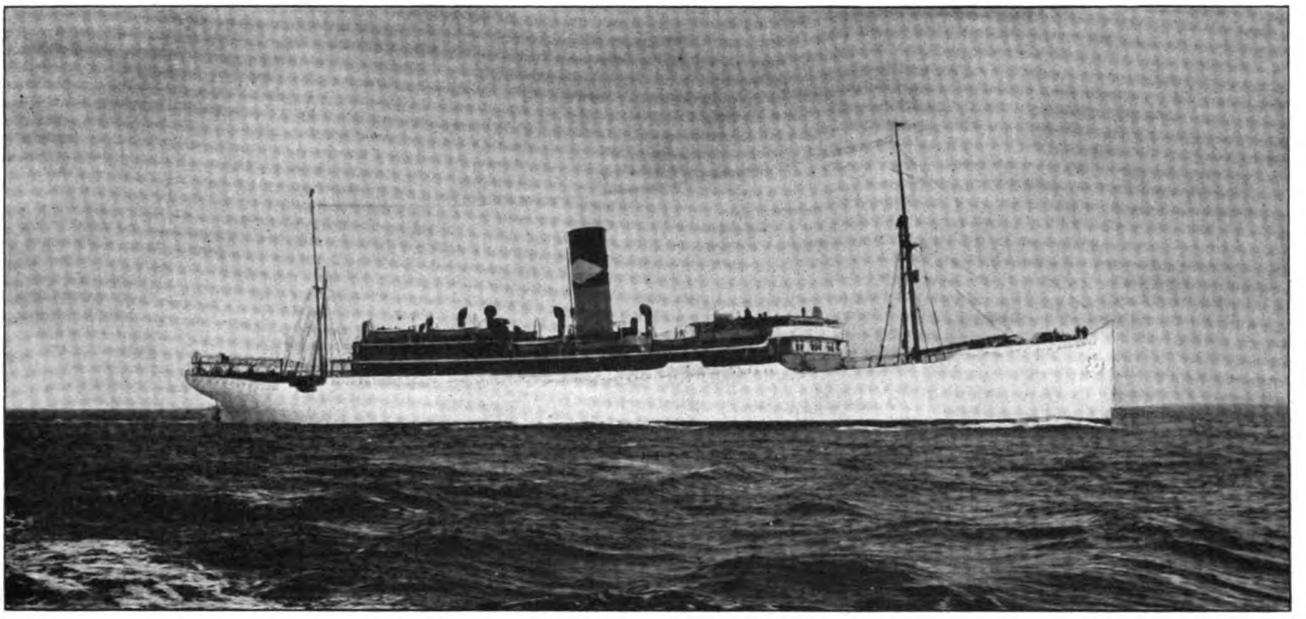
Lieut. Com'dr. Gilbert P. Chase, in charge of the branch hydrographic office, calls attention to this "as the subject is bound to be of interest to every one connected with ships".

Penberthy Injector Service

The Penberthy Injector Co. has received a very interesting letter from E. G. Stewart, Fleming street, Coraopolis, Pa., one certainly calculated to delight the heart of any manufacturer. He writes:

"My injector has played out. It has given eighteen years of service and it was a Penberthy, and I want another one. The one I have is size DD. In winter we carry 90 pounds steam pressure and in summer 20 pounds, 100-horsepower return tubular boiler, and a water pressure of 45 pounds. Would the non-lifting, automatic injector be all right? I think it would, and could I get it with 1¼-inch connections?"

THE MARINE REVIEW will extend the subscription of any subscriber three months who will send to it a copy of the December, 1913 issue.



STEAMER PASTORES OF THE UNITED FRUIT CO.'S FLEET

United Fruit Steamers

Some years ago, Andrew W. Preston, president of the United Fruit Co., decided that travel to the tropics should be as perfect as human ingenuity and money could make it. He conceived the idea of building vessels that would be the coolest in the world and, therefore, ideal for cruising the Caribbean Sea.

The Great white fleet is the result and today there are no cooler ships afloat than the high class modern passenger vessels that are operated by the United Fruit Co. between New York, Boston, New Orleans and Havana, Jamaica, Panama, Gautemala, British Honduras, Costa Rica and Colombia.

Experiments have demonstrated that the staterooms, social halls and decks on these vessels can be kept as cool as may be desired, no matter what the latitude may be.

The sides of the ships are lined in the interior with galvanized sheet steel, backed with felt, silicated cotton and cork. A wooden partition provided with sliding shutters is built up a foot apart from the ships' sides.

In the cooling process the air is drawn into the ships by powerful exhaust fans, driven by dynamos. It is then treated with brine, and before it reaches the saloons, cabins and other parts of the ships it has been subjected to four processes.

High winds prevailed on Lake Superior during the latter part of June and the steel barge George E. Hartnell was blown up on the beach at Duluth. The steamer Harvey Brown attempted to go to her assistance but was thrown against her, damaging both the Hartnell and herself. The steamer America, which was bound for Two Harbors light for ore, was caught in the gale and was unable to make that port. She was forced to go to Duluth for shelter. The steamer Mataafa, while entering the Superior entry canal was blown against the canal pier, damaging her rudder and shoe.

SUMMARY OF NAVAL CONSTRUCTION.

Name of vessel.	Contractor.	Per cent of completion. June 1, 1914. Total.	June 1, 1914. Per cent on ship.	May 1, 1914. Total.	May 1, 1914. Per cent on ship.
	BATTLESHIPS				
Nevada	Fore River Ship Building Co.	67.0	57.0	63.9	53.3
Oklahoma	New York Ship Building Co.	69.0	65.6	67.2	63.9
Pennsylvania	Newport News Ship Building Co.	33.8	24.7	29.1	19.9
	New York Navy Yard	13.1	10.6	11.5	7.5
	DESTROYERS				
Downes	New York Ship Building Co.	95.3	95.3	95.3	95.3
O'Brien	Wm. Cramp & Sons	68.0	64.4	62.2	57.9
Nicholson	Wm. Cramp & Sons	66.4	62.4	60.5	55.8
Winslow	Wm. Cramp & Sons	63.2	59.0	54.4	49.0
McDougal	Bath Iron Works	95.8	95.7	89.3	88.6
Cushing	Fore River Ship Building Co.	44.8	39.4	41.5	35.8
Ericsson	New York Ship Building Co.	69.6	68.9	61.6	60.6
Tucker	Fore River Ship Building Co.	9.7	3.9	9.4	....
Conyngham	Wm. Cramp & Sons	7.7	1.9	6.8	....
Porter	Wm. Cramp & Sons	7.6	1.9	6.7	....
Wadsworth	Bath Iron Works	24.8	19.1	17.5	11.4
Jacob Jones	New York Ship Building Co.	9.9	1.8	9.8	....
Wainwright	New York Ship Building Co.	9.9	1.8	9.8	....
	DESTROYER TENDERS				
Melville	New York Ship Building Co.	50.6	49.4	47.3	45.6
	SUBMARINES				
G-4 (2)	American Laurenti Co. (Philadelphia)	96.4	95.5	96.4	95.5
G-2 (1)	Lake Tow Boat Co. (Bridgeport)	89.7	89.7	89.7	89.7
G-3 (1)	Lake Tow Boat Co. (Bridgeport)	82.3	81.9	81.6	81.3
K-3	Electric Boat Co. (San Francisco)	94.2	94.2	94.0	94.0
K-4	Electric Boat Co. (Seattle)	94.2	94.1	93.9	93.4
K-5	Electric Boat Co. (Quincy)	95.7	95.7	92.8	92.8
K-6	Electric Boat Co. (Quincy)	95.7	95.7	92.8	92.8
K-7	Electric Boat Co. (San Francisco)	91.6	91.1	88.9	87.6
K-8	Electric Boat Co. (San Francisco)	90.0	89.5	88.4	87.1
L-1	Electric Boat Co. (Quincy)	34.6	29.3	30.3	25.1
L-2	Electric Boat Co. (Quincy)	35.0	29.7	30.3	25.1
L-3	Electric Boat Co. (Quincy)	34.4	29.4	30.3	25.1
L-4	Electric Boat Co. (Quincy)	34.0	28.5	30.2	25.0
L-5	Lake Tow Boat Co. (Bridgeport)	14.2	11.1	8.1	4.6
L-6	Lake T. B. Co. (Long Beach, Cal.)	11.5	6.9	....	....
L-7	Lake T. B. Co. (Long Beach, Cal.)	11.0	6.3	....	....
M-1	Electric Boat Co. (Quincy)	25.7	20.5	20.8	16.8
L-8	Portsmouth, N. H., Navy Yard	....	....	....	....
L-9	Electric Boat Co. (Quincy)	5.3	2.3	1.9	....
L-10	Electric Boat Co. (Quincy)	5.3	2.3	1.9	....
	SUBMARINE TENDERS				
Fulton	New London S. & E. B. Co. (Quincy)	67.4	64.8	62.3	59.2
Bushnell	Seattle Construction & D. D. Co.	36.6	27.1	33.6	22.4
	FUEL SHIPS				
Kanawha	Mare Island Navy Yard	57.1	56.4	49.0	47.6
Maumee	Mare Island Navy Yard	28.4	23.8	25.9	20.7
	MISCELLANEOUS				
Supply Ship No. 1.	Boston Navy Yard	....	....	....	....
Transport No. 1.	Philadelphia Navy Yard	....	....	....	....

(1) Contracts forfeited, vessels being completed New York Yard.
(2) Conditionally delivered at Philadelphia Yard Jan. 22, 1914.

The Egotist

By James Rossan.

"Hell!" said Captain McTodd, as he contemptuously threw the letter on his desk. "Does he think this boat is too big for me? I have been successful in every command I have had, and he knows it."

McTodd had sailed many of the smaller ships of a certain lake fleet, and now he suddenly found himself promoted to the newest and largest ship of the fleet. For some time a relentless Nemesis had pursued this boat, one mishap had followed another, and now the manager had attempted to break the spell by placing his most successful captain in command.

Wise in His Generation

The letter was from the manager, who was a man wise in his generation and fatherly in his ways. It was fraught with good advice about careful navigation, personal safety and harmonious team work aboard the boat. It even went so far as to advocate that the captain hold consultations with the officers of the ship at stated periods, and also with members of the crew if he deemed it advisable. And that they discuss matters pertaining to the safety and efficiency of the ship. This clause earned the captain's contempt for that letter, as he gritted his teeth and said:

"I guess it's up to me."

Now let it be recorded right here that McTodd was an efficient skipper. He was a graduate of the hard school of experience. He had worked boats, both at sea and dock, for years, and always successfully. And the intricacies of lake navigation were an open book to him. Neither was he lazy. Active and alert, his eagle eye watched everything, self-reliant his mind held a domineering sway over all things on the Monarch.

Promptly the ship was inspected by its new captain, and then things swung along to his orders as she shuttled forward and back over the world's busiest highway, delivering cargo after cargo safely and promptly.

Then came a trip when Mr. Nemesis took a new and firmer grip. At the unloading dock a hurried shift became necessary. A seaman placed a cable over a dock pile, hesitated a moment, the winch was suddenly reversed, and the seaman lost two fingers.

The second mate was called to account for this, and informed the master that for some time he had been worried about the woeful condition of the ship's cables because they were not provided with bales for handholds, which would prevent just such accidents. However, as the captain looked after those matters, took all responsibility, and brooked no interference, he had considered it safe.

There is an old saying, that accidents never come singly. While sweeping the tops of the side tanks, a careless seaman made a misstep, fell to the cargohold and was killed. This man was working under the first mate, and what the captain said to that mate cannot here be recorded.

"Sir," the mate responded, "it is impossible for me to hang onto each one of them when they are working there. But I have repeatedly attempted to call your attention to a matter I have read about, and which is now being adopted on many of the boats, namely, that of stretching a temporary cable above the inner edge of the tank tops. And you will probably remember that my answer has invariably been to the effect that the master of this ship was perfectly conversant, not only with the matter of sailing a ship, but also with the matter of properly equipping one." This set McTodd a-thinking hard. Could he really be incompetent?

When Lake Superior was reached on the up-bound voyage, the fog set in. The engines were checked, and every safeguard known to navigation was worked with a vigor which was almost tyrannical. The captain would not be found incompetent when it came to the matter of safe navigation. In time the rotor of the log struck a piece of driftwood and was lost. No spare was at hand. But the captain, being a prudent navigator, had from previous trips a perfect record of the engine revolutions from point to point, and could depend on that.

The Refractory Pump

The engineer and oiler were below, giving a refractory pump the "once over", when the master proceeded to the engine room to read the revolution counter; he would trust this important matter to no one but himself. He read, went forward, made his subtraction, allowed for slow speed, and found that he had still two hours to run with plenty of sea room. The deep sea lead showed no bottom, and he sat down perfectly contented.

Instantly there was a scraping, grating noise forward, a heavy lurch to port, and the Monarch was planted on a rocky ledge near the shore, with six compartments full of water.

Later, when the captain spoke to the engineer of the error in the revolution counter, that individual answered:

"Hell! That thing became disconnected. As we were busy with other things, it was hours before we discovered it and connected it up again. We were not aware that you read it, nor that you were depending on it, as you never spoke about it."

In due time the wreckers got the Monarch, and then the ship yard. The bill was $60,000 and the loss of time three weeks. So it was a very contrite skipper who started back with her to complete his trip.

With an appearance as abject and a step as desultory as a man walking to the gallows, the captain entered the home office, where the manager, in his blunt way, greeted him with the following:

"Well, captain, what have you to say? One serious injury, one fatal accident, and a stranding. Some trip!"

Made Only One Mistake

The captain hung his head dejectedly and answered:

"Yes, and the worst of it is that I am entirely to blame. I have always counted myself an efficient master, and now I suddenly find myself incompetent."

"Sit down, captain," the manager continued, "and tell us all about it." And the captain told the truth, the whole truth and nothing but the truth.

Now it has been recorded before that this manager was a wise man, and he spoke again:

"Had you heeded my warning and studied the literature I sent you, this would not have happened. Had you consulted with and heeded the warnings of your mates, no seaman would have been injured or killed. Had you consulted with the engineer, your ship would not have stranded."

"I know it," the skipper replied. "I made three bad mistakes, for each one of which I merit discharge."

"My God, man!" the manager snapped at him. "Do you not see it yet? You made only one mistake, and that consisted of not enlisting the aid of your officers and crew in the safe operation of your ship. The man who can alone take proper care of a modern steamer with its many intricate parts is not yet born. One star and eight incompetents will never win a baseball pennant. Neither can a great general win battles with an army of blind and lame men. Just so is it aboard ship; it is harmonious team work and the general efficiency of the whole which count. This must be carried from the captain to the head of each department, and from them even to each individual. We then build up a machine which is wonderful in its precision and irresistible in its power."

Gradually it was dawning on the captain's mind why this man was manager of large fleets, and why

those fleets were usually successful. Although momentarily expecting to hear his doom pronounced by this man, his admiration for him grew, and his own narrow-mindedness stood out in sharp contrast.

It has also been previously stated that the manager was of the fatherly sort. For a long time he sat silently staring into space and chewing viciously at his unlit cigar. He noted the dejected appearance of the captain, and also the increased tinge of gray about his temples. Presently he spoke again, and his tone was kindly:

"No, captain, you are not an incompetent. You are a very efficient master. But you have simply attempted the impossible, and there is a limit to human ability.

"Stand out prominent as a leader and reserve final judgment for yourself. But melt the men under you into a harmonious whole, and give the closest and most careful consideration to the slightest suggestion for improvement, even though it comes from the most humble.

"I doubt not that the lesson you have learned is inscribed so indelibly on your mind that it will stand you in good stead in future years.

"Go back to your boat and mark you well my words!"

Nearly overcome with joy at his great good fortune, the captain extended his hand and said slowly:

"Thank you, sir! I have gained much, and it shall also be your gain."

Lake Erie Ore Receipts

Out of a total movement of 5,502,367 tons of iron ore during June, 4,383,045 tons were received at Lake Erie ports, distributed as follows:

Port.	June, 1914.
Buffalo	402,621
Port Colborne	37,551
Erie	53,467
Conneaut	1,143,049
Ashtabula	977,358
Fairport	207,051
Cleveland	914,285
Lorain	363,219
Huron	104,447
Sandusky	.....
Toledo	114,945
Detroit	65,052
Total	4,383,045

June Ore Shipments

Ore shipments during June were 5,502,367 gross tons as against 7,974,444 gross tons for June, 1913, a decrease of 2,472,077 tons. Up to July 1, 9,624,116 tons have been moved as against 16,125,042 gross tons for the corresponding period last year, a decrease of 6,500,926 tons. The movement is therefore 40 per cent less than it was for the same period last year. The movement to June 1, however, was more than 50 per cent less than that of last year, so that the trade is gaining a little headway. No material improvement is expected during July, but it looks now as though the low point of depression had been reached and that one may expect a constantly increasing movement during the balance of the year. The outlook is somewhat more hopeful than it was a month ago and a total movement of 37,000,000 tons for the season is now predicted.

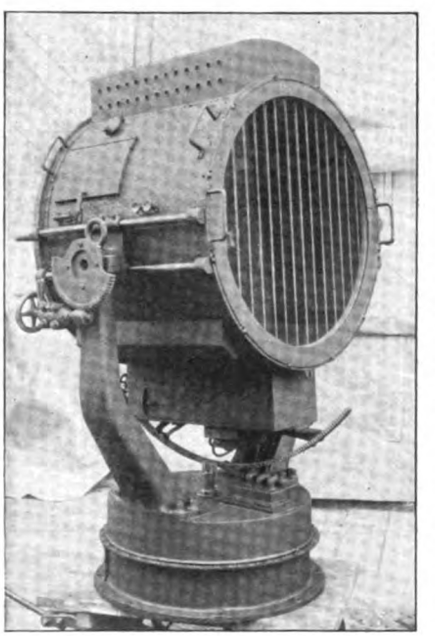
Following were the ore shipments during June and up to July 1, with corresponding data for last year:

Port.	June, 1913.	June, 1914.
Escanaba	845,414	580,103
Marquette	532,736	262,075
Ashland	774,761	541,315
Superior	2,377,078	1,997,895
Duluth	1,895,728	1,045,786
Two Harbors	1,548,727	1,075,193
	7,974,444	5,502,367
1914 decrease		2,472,077

Port.	To July 1, 1913.	To July 1, 1914.
Escanaba	1,800,601	1,076,020
Marquette	1,059,776	383,948
Ashland	1,509,702	883,081
Superior	4,677,349	3,733,502
Duluth	3,995,948	1,779,876
Two Harbors	3,081,666	1,767,689
	16,125,042	9,624,116
1914 decrease		6,500,926

Large Searchlight for Navy

The Carlisle & Finch Co., 247 East Clinton avenue, Cincinnati, has recently furnished the Navy Department with a 36 inch searchlight for one of its vessels. This searchlight is a new departure in that the feeding of the carbons is done entirely by an automatic motor feed which prevents the arc from feeding up too much or breaking and maintains an absolutely uniform light. The searchlight represents a very high grade of workmanship and design. It is equipped with all the latest fittings and accessories, required by the Navy Department and is very complete. A current of 80 amperes and 125 volts is used equal to 12 H. P.



SEARCHLIGHT FOR NAVY

Must Take Tugs

The following section of the Chicago code of 1911, which has been recently declared operative, was put in force July 1:

"1144. All vessels, craft or floats not propelled by steam, navigating the harbor, for which the opening of any bridge may be necessary, shall, while approaching and passing such bridge, be towed by a steam tug. Any steam boat, vessel, craft or float propelled by steam of 1,200 tons gross burden or more, while navigating the portion of the Chicago river bounded by the Rush street bridge on the east, the West Twelfth street bridge on the south and the West Chicago avenue bridge on the north, all inclusive, shall have the assistance of a tug or tugs. It shall be unlawful for any steam boat, vessel, craft or float of 1,200 tons gross burden or more to back through any bridge draw in the Chicago river or the Calumet river within the limits of the city of Chicago without the assistance of a tug or tugs.

"Any person owning or in charge, possession or control of any such vessel, craft or float, who shall navigate or cause to be navigated such vessel, craft or float in the harbor in violation of any of the provisions of this section, shall be fined not less than $25 nor more than $100 for each offense."

The steamer Ohioan, the last of the eight steamers building for the American-Hawaiian Line by the Maryland Steel Co., has been completed. The eight vessels are duplicates, being freighters of the highest class, having accommodations for about 50 passengers and being equipped with refrigerating rooms to handle tropical fruits. The general dimensions are: Length, 414 feet 2 inches; beam, 53 feet, and depth, 31 1/3 feet.

The motor launch Nemadji, recently built for the United States Army Engineer, Philadelphia, from designs by J. Murray Watts, of that city, is of unusual interest. The boat is 60 feet over all, 12 feet beam, having a draft of 4 feet, and is equipped with a 125-horsepower motor. The lines of the vessel resemble those of a tug, capable of weathering a good blow.

Isherwood System of Construction

The Plan Herewith Shows Details of Riveting in Shifts of Butts

By Robert Curr

THE plan herewith shows details of riveting in shift of butts. Fig. 1 shows the completed girder before the abaft transverses No. 9 and No. 13. The keel plate No. 4 and center keelson plate No. 3 are shown on this detail as well as part of rider plates No. 2 and 3.

The floors are omitted and only the flanges of the angles to the plates are here shown. The keel angles are joggled over the butt straps of the keel plate and the top keelson angles joggled over the rider plate straps.

The center plate butt is lapped and has three rows of rivets ¾ inch diameter as shown at No. 12 watertight floor on Fig. 3.

The rider plate has also three rows of ¾ in. diameter rivets but has straps underneath. Fig. 3 shows the underside of the rider plate.

The keel plate butts are strapped with four rows of ⅞ inch rivets, as shown in Fig. 2.

In shifting the butts clear of one another the distance is governed by the number of rivets with a value equal to the material of the whole girder through the line of rivet holes at watertight floor No. 12.

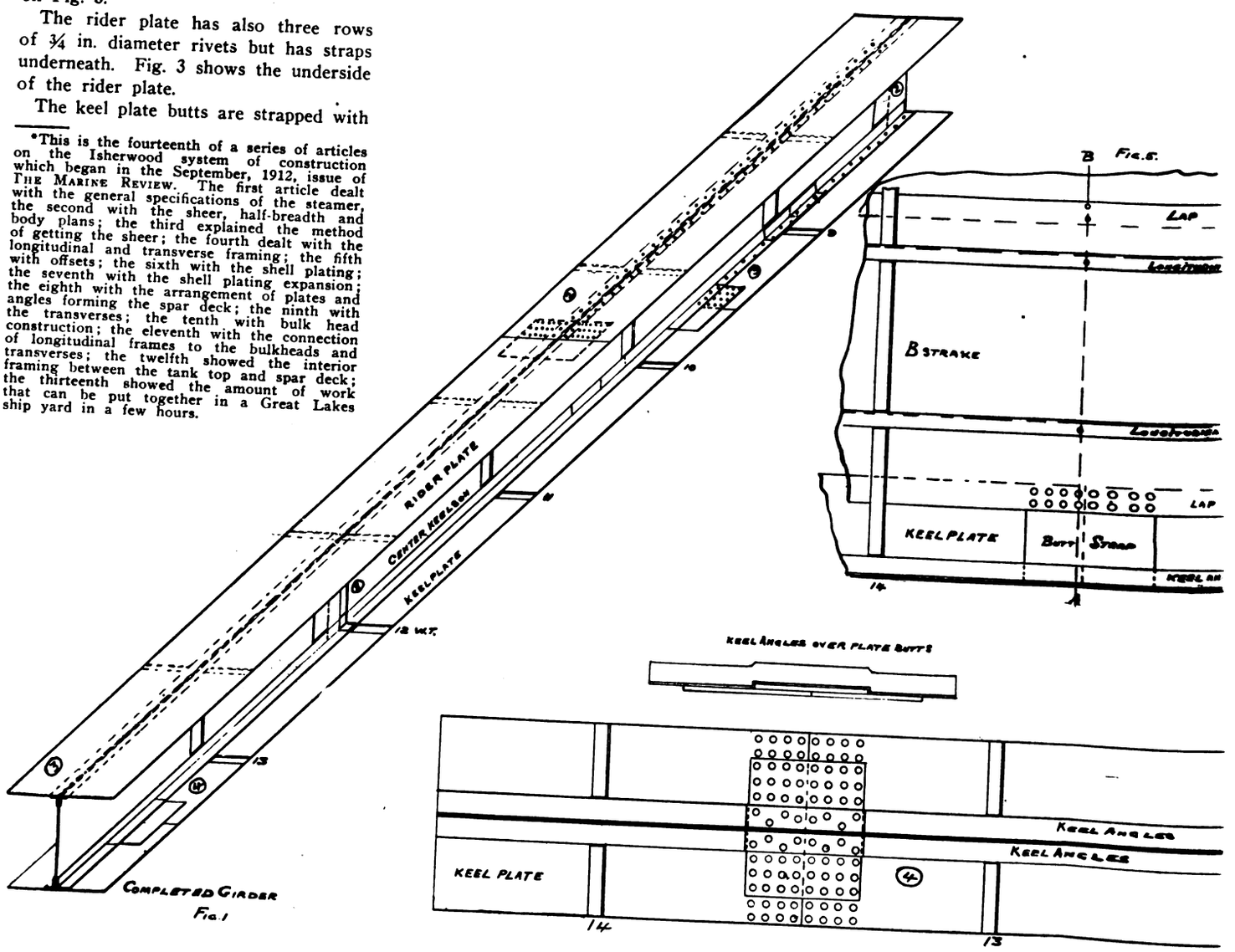
In the last article it was shown that the strength of the center girder through the line of rivet holes at watertight floor No. 12 was 1,340.43 tons. If the rivets were all the same diameter then the strength of a rivet divided into 1,340.43 would give the number of rivets necessary in the different pieces. This cannot be done and every piece has to be treated separately.

The plates and angles are tested at the makers at 28 tons per square inch and by punching the materials the strength is reduced to 26 tons.

The rivet materials are also tested at the makers at 28 tons per square inch but are figured out at the same strength as the punched materials.

The center girder under consideration we have two sizes of rivets ⅞ inch diameter in the keel and keel angles and the balance ¾ inch diameter.

*This is the fourteenth of a series of articles on the Isherwood system of construction which began in the September, 1912, issue of THE MARINE REVIEW. The first article dealt with the general specifications of the steamer, the second with the sheer, half-breadth and body plans; the third explained the method of getting the sheer; the fourth dealt with the longitudinal and transverse framing; the fifth with offsets; the sixth with the shell plating; the seventh with the shell plating expansion; the eighth with the arrangement of plates and angles forming the spar deck; the ninth with the transverses; the tenth with bulk head construction; the eleventh with the connection of longitudinal frames to the bulkheads and transverses; the twelfth showed the interior framing between the tank top and spar deck; the thirteenth showed the amount of work that can be put together in a Great Lakes ship yard in a few hours.



The value of a rivet is found by squaring the diameter and multiplying by 0.7854 the strength of the material. Example:

The strength of a ⅞-inch diameter steel rivet equals ⅞ inch × ⅞ inch. × 0.7854. × 26 = 15.6338.

The strength of a ¾-inch diameter steel rivet equals ¾ inch × ¾ inch × 0.7854 × 26 = 11.4868.

The strength of double shear equals single shear by 1.75.

15.6338 × 1.75 = 27.349 for ⅞ inch diameter rivet. 11.4868 × 1.75 = 20.1. In these considerations 15 tons will be considered for a single shear of ⅞-inch diameter rivet and 27 tons for double shear.

For single shear ¾-inch diameter rivet 10 tons and 17.5 for double shear.

The keel plate has a strength of 490.75 tons through the line of holes at No. 12 and $\frac{490.75}{15}$ = 32.6 rivets.

Fig. 2 between the transverses 13 and 14 shows the number of rivets in butt arrangement of the keel plate, the butt before No. 10 shows 32, the actual number of rivets in the buttstrap. The 12 extra rivets in the butt are for the seam lap of *B* strake.

The center keelson plate has a tensile strength of 287.56 tons $\frac{287.56}{10}$ = 28.75 rivets. Fig. 3 abaft No. 12 shows the center keelson but with 30 ¾-inch diameter rivets between the angles which is all that is necessary. The rider plate has a strength of 357.5 tons $\frac{375.5}{10}$ = 35.75 rivets, ¾ inch diameter. Fig. 4 before No. 11 shows 48 rivets but 12 are for the tank top seam strap. 36 rivets are ample for this butt connection.

Summing up the rivets at their weakest consideration they are double the strength of the plates and angles.

Example:

	Rivets.	Tons.
Center keelson plate butt has	30 equal to	300
Center keelson and rider has	70 equal to	700
Butt of rider has	36 equal to	360
		1,360
Keel plate angles	46 equal to	690
Keel plate butt	32 equal to	480
		2,530

It will be found throughout the vessel that the rivets exceed the plates and angles.

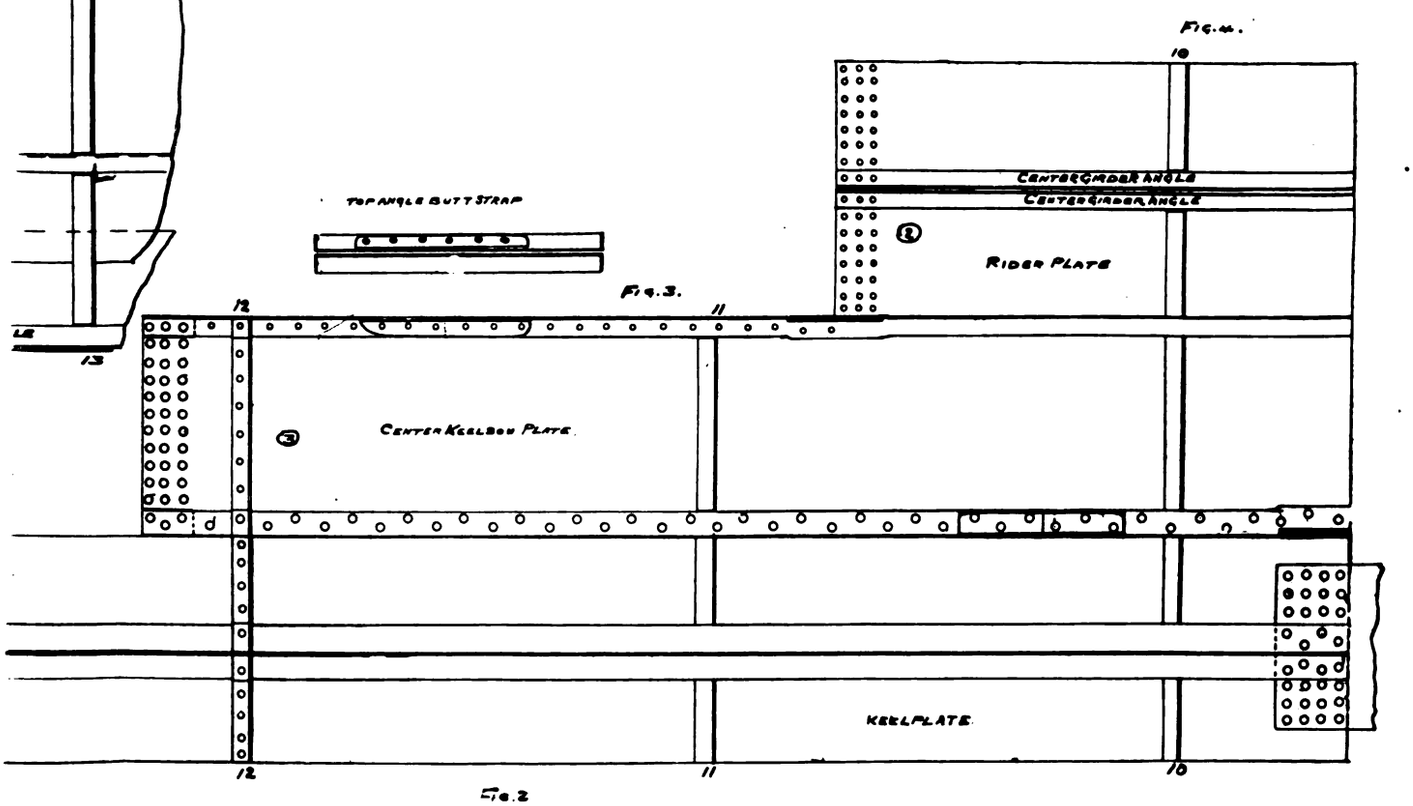
There is no way to lessen this owing to it being necessary for a close pitch of rivets to make the outside plating watertight.

It will be observed that there are more rivet holes in the outer rows in the butts than at frame No. 12 and of course would not be allowed for a single girder. The passing strakes takes care of this as shown by Fig. 5. Through the line *AB* there are only six rivet holes which would only reduce the width of the plate from 60 inches to 54 inches and there are two channel longitudinal frames in this space which adds to the strength.

Year's Ship Building

During the fiscal year ended June 30, 1914, there were built in the United States and officially numbered 1,291 vessels, of 311,578 gross tons, compared with 1,648 vessels, of 382,304 gross tons, for the same period of 1913.

The principal vessels are four American-Hawaiian Co. steamships, each of 6,600 gross tons, and three Grace Co. steamships, each of 6,300 gross tons, all for the Panama canal trade, and averaging 4,000 net tons. The steamship Matsonia, for Hawaiian trade, 9,728 gross tons, is the largest vessel built in the United States since 1905, and the John D. Archbold, 8,374 gross tons, is the largest oil tanker yet built in the United States. On the Great Lakes 10 steamers of over 1,000 tons each were built, the Alton C. Dustin, 7,978 gross tons, being the largest. Only three large schooners were built. In all, 38 vessels of over 1,000 tons each were built, aggregating 169,000 tons.



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Careful Navigating

That vessel owners are sincere in their instructions to their masters to navigate their ships carefully is well borne out in a recent letter, which Hutchinson & Co., of Cleveland, one of the large independent operators on the lakes, sent to one of their masters commending him for delay in reaching port even though they had previously instructed him to hurry. The delay, of course, was due to proceeding under check during fog and the letter of Hutchinson & Co. to the master was as follows:

"When you arrived at Calcite you wired us you had been delayed by fog, which we assume meant you had been running under check because of fog. If that is what it meant, we desire to express our approval of your safety first policy, as well as our appreciation of your proper observation of the navigation rules. It is especially gratifying to us to know that although you had been requested before leaving Indiana Harbor to hurry if conditions justified it, that you placed the proper interpretation upon that request and did not jeopardize the safety of your ship, as well as the safety of other ships, in order to make time. Much as we now need cargoes, we would prefer to lose a cargo through being late than to have you take chances and violate the rules relating to navigating in foggy weather.

"Please understand that whenever you are requested to hurry, it means that you are to do it if conditions are such that it is a safe thing to do. Do not sacrifice safety for speed.

"Remember our motto, 'Safety First'. Under all circumstances, please, have it uppermost in your mind."

Copy of this letter was transmitted to every master in Hutchinson & Co.'s fleet, with the following notation:

"What we said to this captain applies with equal force to you. Please, therefore, read carefully and in the navigation of your ship, please, conduct yourself accordingly, and, please, remember that while it gives us pleasure to commend compliance with the rules making for safe navigation, we shall condemn with all the vigor at our command any violations of rules or any evidence of reckless or unsafe navigation of your ship. We trust you will understand and appreciate that it is our desire to promote safe navigation on the Great Lakes, and if you will do your part, it may help others to also be careful. In any event, if you are careful, it will satisfy and please us."

It is not sufficient, however, to commend a man for observing the rules of navigation. He should be condemned when he fails to observe them, regardless of the success of his venture. A master belonging to this same fleet performed a very successful maneuver not long ago and one which reflected his extraordinary skill, but there was nevertheless a large element of chance in it. If he expected commendation he was mistaken for what he got was a very sharp rebuke and a positive injunction never to attempt any such performance again.

Nothing is gained by shutting one's eyes to successful chances. That kind of a navigator will sooner or later do mischief. No man can come through the rivers in thick weather with scores of boats at anchor without running risk.

Smoke in Harbor

Two vessel masters were recently fined in Milwaukee for violating the smoke ordinance. Municipalities in general are now paying considerable attention to the production of smoke, which is really a most destructive nuisance. Among the notable offenders are railway locomotives and vessels in harbor, especially tugs. There is no doubt that a great deal of the smoke caused by the bulk freighters of the Great Lakes while in harbor could be eliminated by careful stoking. In entering harbor the proper place for the fireman is in the stokehold. Some of them have a habit of putting on a heavy fire while navigating the rivers and then going on deck to see the sights. In entering harbor care should be taken to see that the fires have not been allowed to get too low, because if there is any river work ahead with probable dragging of the bottom, the engines will have to be worked at full speed. In this extremity, of course, the fireman will try to hold the steam or raise it to the regular working pressure and in order to do this will throw on two or three heavy fires,

causing a dense smoke. The fireman should be instructed to watch the steam closely, not allowing fires to get too low, and when it is necessary to fire, one furnace should be fired at a time and that very lightly. Light firing in port will comply with the requirements of any reasonable smoke ordinance.

Navigation In Fog

THE MARINE REVIEW has received a communication from a master, who does not sign his name, regarding the editorial on Navigation in Fog, published in the July issue. It is not usual to publish anonymous contributions, but this one is quoted because it offers an opportunity to reiterate what the leading managers have been for some time past endeavoring to have their masters comprehend. It apparently seems impossible to make certain masters understand that speed is not preferred to safety. The only thing to do is to weed them out as fast as they can be discovered. The keynote of the instructions given to the masters at the various annual meetings of the steamship companies is safety, and it is extremely exasperating to have these instructions deliberately violated. This communication reads as follows:

EDITOR, MARINE REVIEW: — Your article in July number on Navigation in Fog is very good, but if the owners want their masters to handle their boats as if they owned them themselves, why is it they follow the rule and always have of promoting the captain that gets there Eli? You know that and so does every owner. If one is a reckless son of a gun and gets through the season one trip ahead of the other fellow, he is a hero and gets promoted. I'm in the game and know what I am talking about. If I can't do as well as the other fellow I am a back number and get set back instead ahead. No vessel manager will ever rebuke his master for getting through in a fog if he gets through safely. They never have. They have encouraged it rather unless they have a mighty change of heart all at once, and you know it. This rebuking the master they are between the devil and the deep sea. Talk about rebuking them better get after Mr. Manager and see how he has done his promoting in the past and you will find the key to the whole situation."

The author of this communication is probably one of the kind that dies hard. He has an idea riveted in his head that apparently he cannot get rid of. It is probably true that some years ago ships were driven at full speed regardless of circumstances; it may be true that some are so driven today, and it also may be true that here and there is a detached manager who, having no special financial investment at stake, winks at the law; but it is also true that the leading fleets are very much in earnest that their masters shall absolutely obey the law relative to navigation in fog. When some of these masters begin paying fines out of their own pockets for violating the rules, they will probably begin to understand that they are violating the rules upon their own responsibility. It is a foregone conclusion that the government will exact fines from now on for violating the pilot rules and these fines will not be paid by the owners.

At the annual meeting of the Pittsburgh Steamship Co., Mr. Coulby told his masters that he had never considered the amount of cargo that a ship had carried or the number of trips she had made in a season when promoting a master, but that he had been governed by freedom from accident and care of the ship. In the present issue of THE MARINE REVIEW there is quite a long communication from him to his masters on the subject of collision in fog and the statement is very distinctly made that if he finds any violation of the pilot rules, even though the ship may not meet with disaster, he will take such action with reference to the navigating officer as though there had been a collision.

The Lake Carriers' Association incorporated the editorial of which this master speaks as a part of its July Bulletin to vessels enrolled in the association, and it would seem as though the situation ought to be quite clear to every master that the owners desire moderate speed in fog.

Lake Trade Lifeless

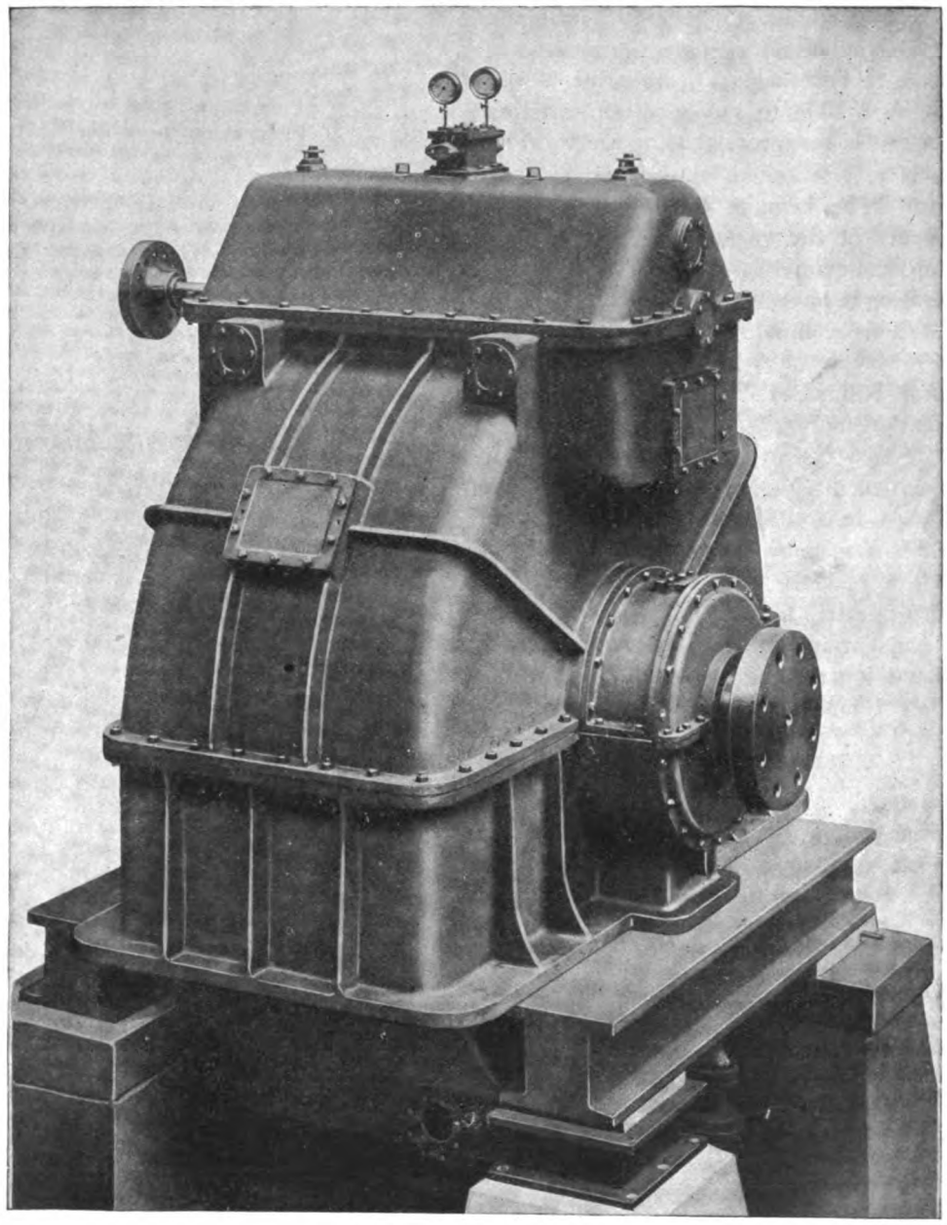
Another month has gone by and, if anything, lake trade is in a worse condition than it was a month ago. There was some hope of an improvement about July 1, but it did not materialize, and, if anything, the trade is more listless than ever. Sales of ore have been extremely light and vessel after vessel has gone into ordinary. Now that the first rush of grain is over, it is clear that there have been too many ships in commission all along for the business offering. No material change is now expected until the fall months. Grain has been carried at figures that leave no profit to the ship and the rates for future chartering are very low. Were it not for the fact that crops are very heavy, there would not be a single ray of sunlight in the whole situation. Scores of mines have shut down, some because they cannot sell the ore and others because they cannot be profitably operated at present prices. All along the line the whole business is being conducted at a loss and there has never been a time when things have been as dull on the lakes as they are now.

Sorry sights are to be seen at all Lake Erie ports. Dozens of ships are moored broadside to broadside behind the breakwaters. Some have been there since the season opened, some have made a trip or two and some more that are now making trips will be added to the idle fleet as soon as they discharge present cargoes. And some people say that the depression is only sentimental. We wonder what they consider a real depression to be. The depression of 1893 was certainly not as complete as the present one.

Collier Neptune

The Westinghouse Turbine and Reduction Gear Propelling Machinery for the Collier Neptune

IT IS well known that when a shaft is transmitting power, the torque exerted creates a definite twist or torsional deflection which is directly proportional to the load transmitted and inversely proportional to the cube of the shaft diameter. This deflection of shafts, when transmitting large power, is the basis of practically all of the torsional dynamometers used to determine the amount of power transmitted to the propellers in marine turbine installations. Various methods are used to indicate the torsional deflection from which the torque transmitted is calculated. The pinion of a reduction gear may be considered as an extension of the turbine shaft, and as such it will have a certain deflection proportional to the power transmitted from the turbine to the propeller. Consequently, the driving end of the pinion will be advanced with respect to the end most remote from the point of application of the driving force. Since it is impossible for slip to occur between the pinion and the driven gear, the end of the pinion nearest the point of application of the driving force, will tend to climb or advance along the driven gear slightly ahead of the end of the pinion farthest removed from the point of application of the driving force.



WESTINGHOUSE TURBINE

If we were to assume then that the bearings in which the pinion is supported were fitted very loosely with a considerable clearance around the pinion journals, the pinion would climb or advance along the face of the driven gear at the driving end by an amount equal to the torsional displacement of the teeth between the near and far end of the pinion, thus causing the axis of the pinion to incline itself at a slight angle to a plane passing through the center of the axes of the gear and the pinion when the latter is not subjected to the twisting force. Thus it is seen that the *natural* position taken by a pinion transmitting power, is not with its axis parallel with the axis of the driven gear, but at an inclination, the angle of inclination being proportional to the twisting moment applied to the pinion which, in marine reduction gears, is proportional to the square of the revolutions per minute. Thus it will be seen that no fixed adjustment of any nature whatsoever can compensate for the torsional deflection at all powers and speeds, and any permanent adjustment for some fixed load would cause unequal pressures at all other loads.

This is the basic principle which is made use of in the Westinghouse floating frame, the floating frame being merely a means of permitting the pinion to assume its *natural* position without imposing unnatural stresses on the

bearings and teeth. It will be readily seen that if the axis of the pinion naturally tends to incline itself to the axis of parallelism with the axis of the driven gear, any arrangement which prevents, or tends to prevent this natural adjustment, must necessarily not only subject the teeth of the gear to unnatural and unnecessary stresses of considerable magnitude, but must likewise subject the bearings to similar stresses.

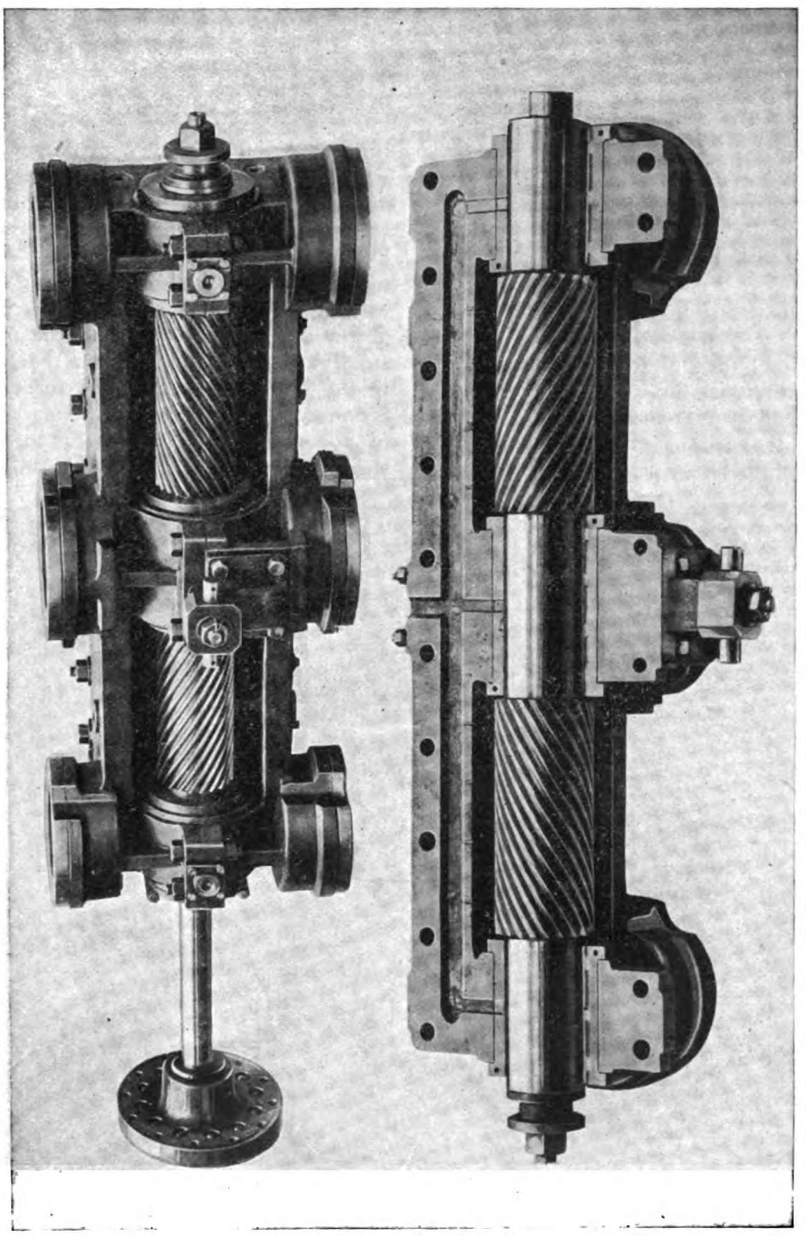


FIG. 1

It may be difficult without previous consideration to appreciate the effect of the torsional deflection, as this is comparatively slight, and consequently the natural tendency is to conclude that it is insignificant. However, if the pinion were assumed to be made of rubber or some equally elastic material, the necessity for permitting the pinion axis to assume its own position without restraint, will become more evident. If we were to assume the pinion made of rubber, it will be readily seen that even with a comparatively small twisting force, the twist in the pinion would become so great that the teeth at the end farthest from the point of application of the driving force would fail to mesh with the teeth of the driven gear, unless the axis of the pinion were free to tip sufficiently to permit the teeth at the end farthest from the point of application of the driving force to lag behind sufficiently to come into mesh.

From the above it will be readily seen that unless the pinion is permitted to assume its own axis, the pressure on the teeth will be greater at one end of the pinion than at the other, and consequently, though the pressure per unit length of pinion face may be sufficiently low if uniformly distributed, it will be sufficiently high locally to disturb the oil film between the teeth and cause undue friction and rapid wear.

It will naturally occur to the reader that if the diameter of the pinion were made sufficiently large in proportion to the power transmitted, the torsional deflection and consequent error between the natural axis of the pinion and parallelism may be insignificant, and this is true within certain limits.

Increasing the diameter of the pinion has serious drawbacks in marine work, since an increase in the diameter of the pinion means a larger increase in the diameter of the driven wheel, the increase in the latter being greater than that of the pinion by the number of reductions of speed.

In order to obtain the full benefit of reduction gearing in marine installations, it is necessary to select the highest number of revolutions per minute permissible for the turbines, and as the propeller revolutions for maximum efficiency must be kept comparatively low, the reduction ratio desirable is generally very large; and consequently any increase in the size of the pinion in order to reduce the torsional deflection, is accompanied by a considerable increase in the diameter of the large gears. Roughly, the weight of a reduction gear is proportional to the square of the diameter of the large gear plus the square of the diameter of the pinion, so it is evident that for a given ratio of reduction the weight of the reduction gears increases approximately as the square of the diameter of the pinion.

Reducing Revolutions of Turbine

If it is attempted to avoid the abnormal increase in weight of the gear due to an increase in the diameter of the pinion for a given power transmitted by reducing the revolutions of the turbine, the result is that a considerable portion of the saving in weight in the gear will be counterbalanced by an increase in weight of the turbine, the weight of the turbines varying approximately inversely as the square of the revolutions per minute. Further, reducing the revolutions of the turbines below the maximum permissible for any given power, results in a decrease in economy, since a turbine reaches its maximum economy when the revolutions for the power developed are the maximum permissible. Likewise, the space occupied and the weight of the combined installation is considerably increased as the revolutions of the turbine are

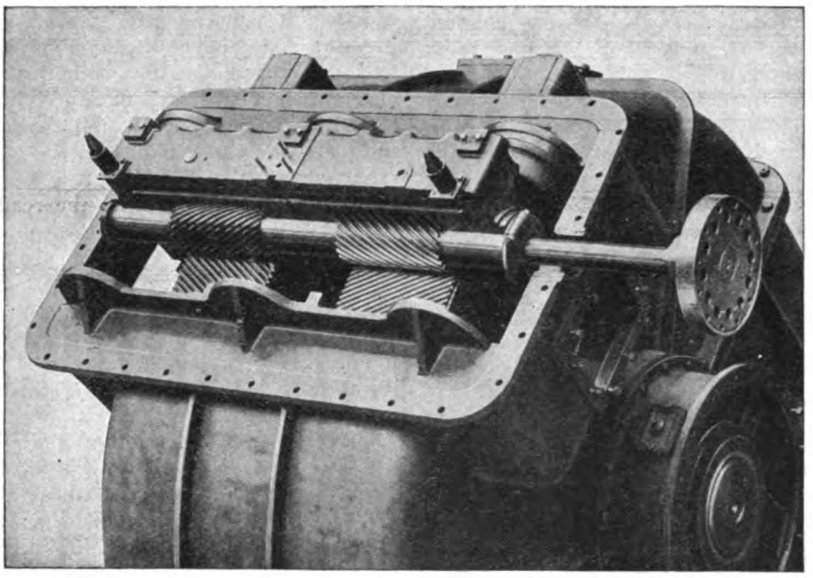


FIG. 2

decreased, and a decrease in the revolutions of the turbine necessitate an increase in the diameter of the pinion, since the torque transmitted for a given horsepower is inversely proportional to the revolutions per minute.

By the use of the floating frame, the size of the pinion required for any given horsepower is not limited by the diameter of the pinion, torsional deflection or strength of the teeth, but by the size of the bearings. Since it is not desirable to make the journals much larger than the outside diameter of the pinion, and only certain maximum bearing pressures and surface speeds are permissible, the limit of capacity of the pinion is reached when the bearings are loaded to the maximum safe limit. In general, however, it is not necessary nor desirable to undercut the pinion teeth below the journals, and the pinion diameter is made just large enough so that the cutters clear the journals. Thus it is seen that the capacity of Westinghouse pinions of any given size is much greater than in any other system of gearing, and the size and weight of the gear are far less for a given ratio of reduction, or for any given limit of diameter of the large gear wheel, a large ratio of reduction may be used.

It will be readily understood from the preceding that particularly in marine installation where weight and space, as well as economy, are the most important factors, it is imperative to have some means of permitting the pinion to assume its natural position in order that a considerable torsional deflection is allowable, and consequently a small pinion diameter for any given power transmitted.

In many marine installations of reduction gears without means for permitting the pinion to assume its natural axis, the result of the necessity for an increase in pinion diameter and the consequent limited ratio of reduction, is evident, as with two exceptions, in all the geared installations with solid pinion bearings, high speed propellers running as fast or faster in some instances than would have been considered necessary in a direct connected turbine installation, have been employed, and in each instance the revolutions of the turbines were considerably lower than desirable for the power developed. Thus, though gears were added, no advantage could be taken of the increase of the efficiency of the propellers which would result from a lower propeller speed, and only part of the gain in economy was realized by increasing the revolutions of the turbines, though some saving in weight was obtained. In the Westinghouse gear, the use of a pinion of minimum diameter and a high speed turbine, has the very marked advantage of permitting the use of very small turbines for the power developed, making all the parts small and easily handled in addition to the saving in weight and increased economy of the turbine, and decrease of power required due to the use of slow speed propellers of high effi-

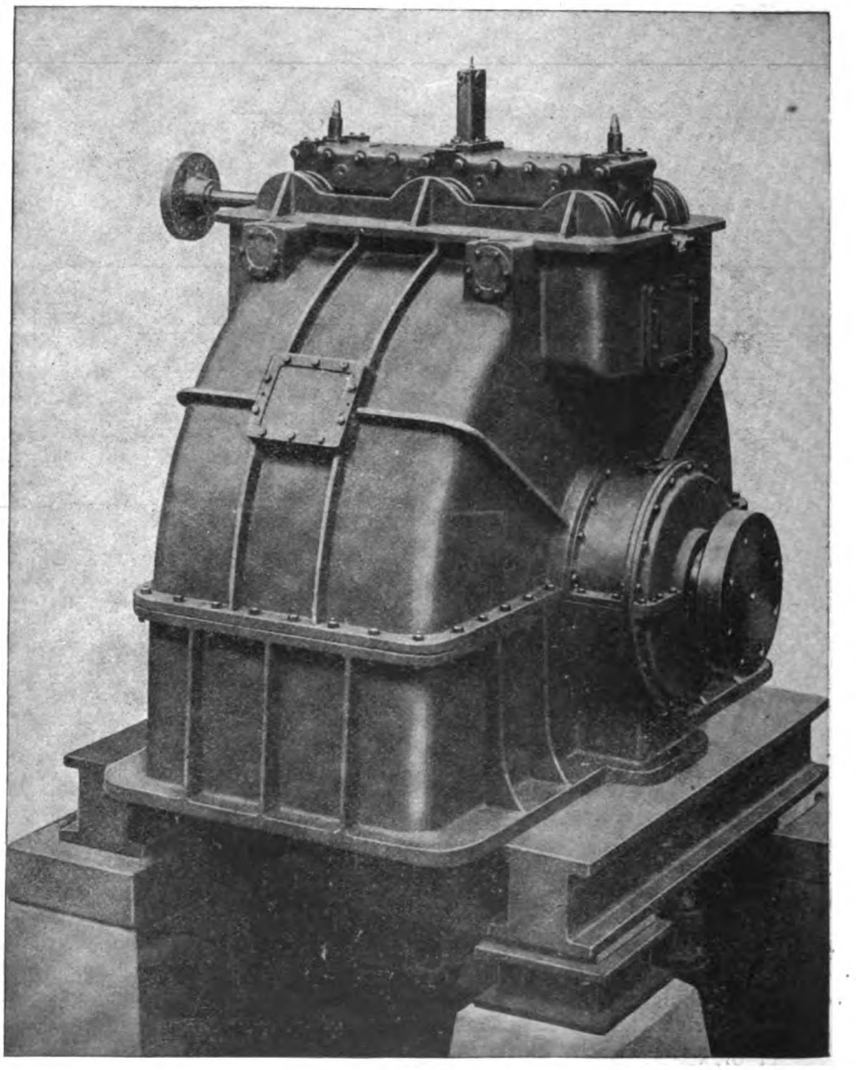


FIG. 3

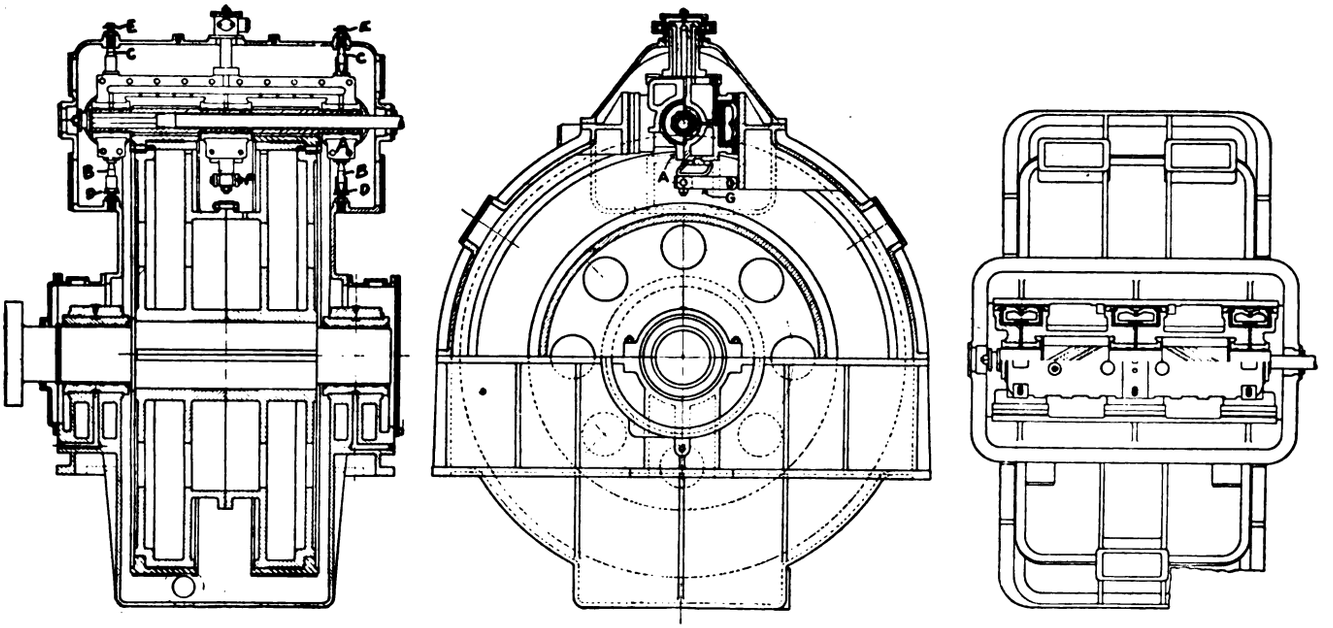


FIG. 4

ciency.

In some instances in reciprocating engine vessels, a lower speed propeller than desirable has been fitted to suit the engine speed, but with the reduction gear, the propeller speed can always be made to meet the requirements of maximum propeller efficiency.

While in most cases the revolutions per minute of a reciprocating engine can be made high enough to give a propeller of maximum efficiency, it is, of course, well known that quite a considerable increase in propeller speed is permissible without decreasing the efficiency of the propeller.

There are a number of important advantages resulting from the use of the fastest running propeller, which will give maximum efficiency, and these may all be secured by the use of reduction gears.

The higher propeller speed and consequent reduction in diameter permits deeper submersion of the screws and less liability to racing in heavy weather, thus allowing a high speed to be maintained. The deeper submersion also reduces the danger of the propeller striking floating objects which might cause the loss of blades.

With the reduction in the diameter, not only is the original cost of the propeller materially reduced, but likewise the cost of renewals and repairs in case blades are lost, and furthermore, the reduction in weight may be sufficient to warrant the use of bronze where otherwise cast iron propellers would be fitted.

The use of the highest propeller speed consistent with maximum efficiency also materially reduces the diameter of the tunnel and tail shafting and stern tube, and reduces the size of plummer and thrust blocks, resulting in a very substantial saving in weight. Also the tunnel shafting of small diameter is not subjected to such high bending stress due to any slight misalignment or bending caused by "hogging" and "sagging" of the vessel, and consequently the plummer blocks are not so heavily loaded and the wear and danger of heating of the latter is minimized.

A further desirable feature of the hydraulic floating frame is that the oil and a certain amount of air which is always entrained with it, serves to act as a dampener, and reduces the noise to a negligible amount. In fact, the noise made by gears fitted with the floating frame, is certainly not in excess of that produced by a reciprocating engine developing the same power, and such noise as is produced, is of a very low pitch and is not of a disagreeable character.

Two of the most essential requirements in passenger service, are absence of noise and freedom from vibration.

Fortunately, high speed turbines with short blades do not produce any appreciable noise, whereas, the slow speed turbines with long blades, which are necessary in direct connected installations, produce a singing noise far in excess of that made by a reduction gear fitted with an hydraulically floated pinion.

In regard to vibration, the geared turbine has all the advantages of the direct connected turbine in the absence of reciprocating parts, and has the advantage that, owing to the slow speed of the propeller, the latter works

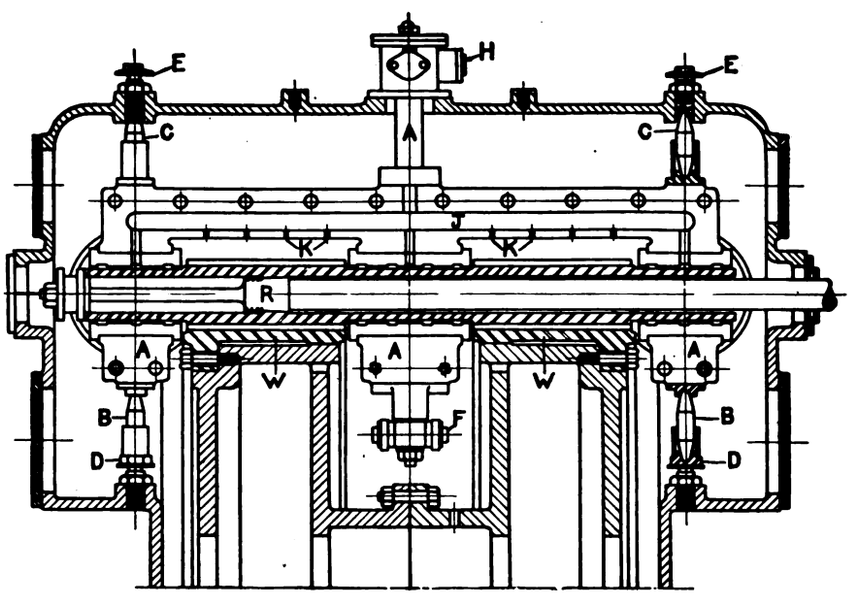


FIG. 5

under conditions so far removed from those where cavitation occurs, that practically all of the vibration due to the propeller, is eliminated, as it has been long since recognized that the greater part of the vibration experienced in direct turbine driven vessels, is due to the fact that the propellers are worked in the region where cavitation is about to begin.

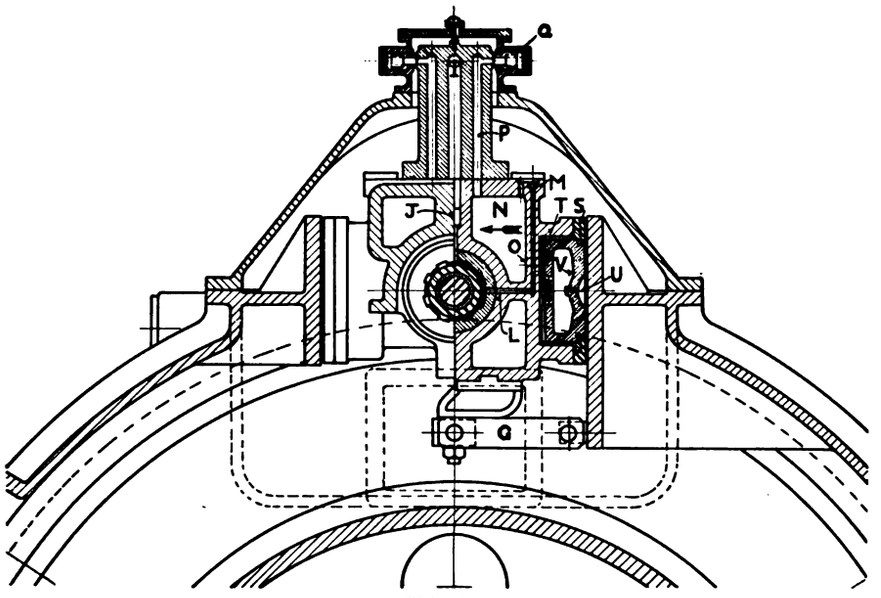


FIG. 6

The propeller vibration, which has been objectionable in a number of reciprocating engine vessels has been rightfully attributed to the change of angular velocity of the screw, and hence, since the turning moment and angular velocity are absolutely uniform in a geared turbine, this source of vibration is eliminated.

A vertical and longitudinal cross-section and partial plan view of one of the 3,000-horsepower reduction gears for the Neptune, is shown in Fig. 4.

Most of the readers are probably familiar with the general principle of the Westinghouse reduction gear, which consists of the floating or movable frame *A*, which carries the pinion in rigid bearings, the frame *A* having freedom, however, to adjust itself in the horizontal plane perpendicular to a plane passed through the center of the shaft and the nominal center of the pinion.

In order to avoid having the weight of the pinion and pinion frame coming on the teeth of the gear and pinion, the frame *A* is supported on struts *BB* held in adjustable sockets *DD*, which permit the vertical distance between the center of the pinion shaft and the gear shaft to be accurately adjusted, and to prevent the radial component of the pinion thrust lifting the frame from between its thrust abutments, a second set of adjustable struts *CC* and accompanying adjusting screws *EE* are provided, thus preventing the pinion shaft from moving away or approaching the gear shaft, but permitting motion in the horizontal plane. The struts and floating frame are shown in detail in Fig. 5 and Fig. 6. Oil for lubricating the pinion bearings and pinion gear is supplied through the opening *H*, which communicates through a sliding contact *I*, Fig. 6, which communicates with the port *J*, extending the length of the pinion frame *A*, Fig. 5. A spray of oil floods the pinion through the ports *KK* and also supplies the bearings at the center line, or point of minimum pressure.

As has been previously pointed out, when a bearing rotates under load, unless metallic contact occurs, oil supplied at the point of minimum pressure of the bearing is carried around by the journal friction and the pressure of the oil film at the point where the load is carried must be sufficient so that the oil pressure times the bearing area is equal to the load on the bearing; otherwise the oil film would be destroyed and metallic contact would ensue as a result. By providing outlets at the point of maximum pressure, a bearing within the limits of its capacity, may be employed as a pump, and this is what is done in the Westinghouse reduction gear, recesses being provided in the bearings at the point of maximum oil pressure in the bearings, which communicate with passages *L*, Fig. 6. A ball check valve *M* is provided in each passage *L*, through the bearings, and each of the passages *L* communicates through this check valve with a common space *N*, which is connected by passage *O* to the space behind the pistons *V*. Now the total area of the pistons *V* is made approximately twice the projected area of the bearings, and hence an oil pressure of approximately one-half that of the oil firm in the bearings if exerted on the pistons *V*, is sufficient to balance the thrust of the pinion; thus as the pinion revolves under any given thrust, oil from the bearings at the pressure of the oil film in the bearings is pumped through the passages *L* to the space *N*, and through the holes *O* to the pistons *V*, balancing the movable or floating frame *A*, carrying the pinion in the direction of the arrow, or opposite to the direction of the pinion thrust, until the opening in the passage *E*, in the arm

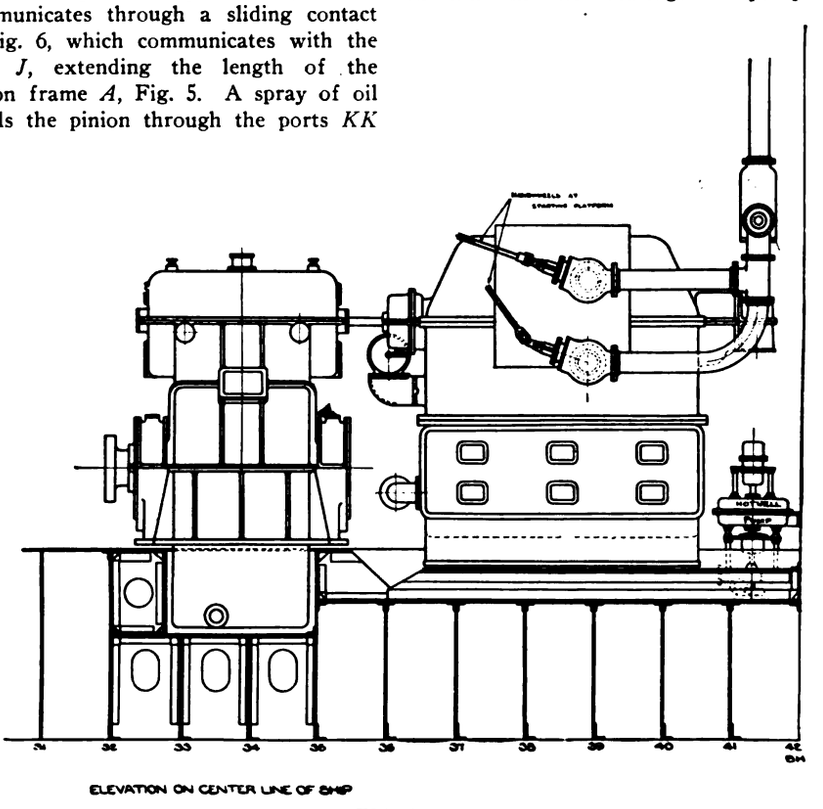


FIG. 7

of the floating frame moves away from the movable seat Q sufficiently to permit the excess oil pumped by the bearings to escape and thus relieve the pressure behind the pistons V until the product of the area of the pistons into the oil pressure is just equal to the total thrust on the pinion. Should the load increase, there is a tendency for the frame to be pushed over against the oil pressure behind the pistons V, and this brings the frame arm against the movable seat Q until the oil pressure behind the pistons again builds up sufficiently to balance the increased thrust; or if the thrust on the pinion decreases, the opposite action will take place. The seat Q is circular and has a shoulder which engages with the housing containing it, and it is held outward by a spring thus forcing it in contact with the pinion frame arm until the frame takes the central position. This is made so that the frame normally, when under no load, can move back until the frame arm comes in contact with the gear housing. To prevent the pinion frame from tipping when the frame arm comes in contact with the housing, a fulcrum F and fulcrum link G are provided which flexibly tie the floating or movable frame to the gear housing, as shown in Figs. 5 and 6.

Referring to Fig. 5, it will be noted that the pinion drive which passes through the hollow pinion is connected to it by a taper fit and circular keys at the point R in the middle of the after pinion. This reduces considerably the total torsional deflection of the pinion under load. There are reasons, however, why it is not desirable to drive the pinion from a point between the two pinions, which would at first seem to be the obvious point to attach the pinion drive shaft, but as this would involve a mathematical discussion, it will be taken up at another time.

The gear wheels are made of cast iron with cast steel rims pressed on, as shown at WW, Fig. 5. The steel castings from which the gear rims are made, are cast two or three times the thickness of the finished rim and with a riser somewhat more than the width of the rim, attached. So far, out of approximately 200 of these rim castings, not one has yet been machined which showed an imperfection at any point sufficiently large to be detected by the eye or by the aid of an ordinary magnifying glass. The material use for the rims is mild steel, having an ultimate tensile strength of about 60,000 pounds, and an elastic limit of about 35,000 pounds.

Figs. 1, 2 and 3 show one of the pinions and floating frames in different stages of assembly. The lubricating grooves for the bearings and pinion spray, are clearly shown in Fig. 1.

One of the pinions and half of its floating frame is shown in place on the gear in Fig. 2, while Fig. 3 shows the gear and floating frame assembled complete ready for the pinion frame cover, which is shown in place and the gear complete in the frontispiece. The gages shown are for indicating the oil pressure behind the ahead and astern floating frame pistons respectively, and the pressure indicated on these gages multiplied by the area of the floating frame pistons in square inches, gives the total effective thrust on the pinion, and this into the peripheral speed of the gear divided by 33,000, is the shaft horsepower transmitted. Experience has shown that the power transmitted is measurable, by this means with an error of less than 1 per cent, so that the need of a torsion dynanometer on the propeller shaft is obviated; and furthermore, by connecting the oil pipes from the floating frame to recording gages and using recording tachometers, it is possible to keep a continuous record of the shaft horsepower developed. A special form of differential pressure gage may also also be used which will record the horsepower direct.

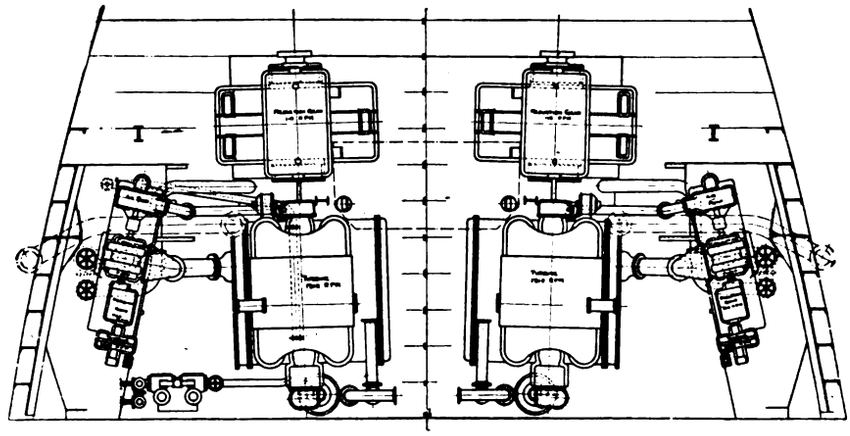


FIG. 9

A general fore and aft elevation of the arrangement of turbine and gears in the engine room is shown in Fig. 7, in which it is seen that the turbine is mounted directly on the condenser as a bedplate. This arrangement with the pinion located on top of the gear, materially reduces the floor space required and at the same time obviates the necessity of disconnecting and stowing the exhaust connections when it is necessary to remove the cylinder cover for inspection. A plan of the engine room of the U. S. S. Neptune is shown in Fig. 9, which shows the location of the air and circulating pumps. Fig. 8 is an end elevation through the engine room looking aft.

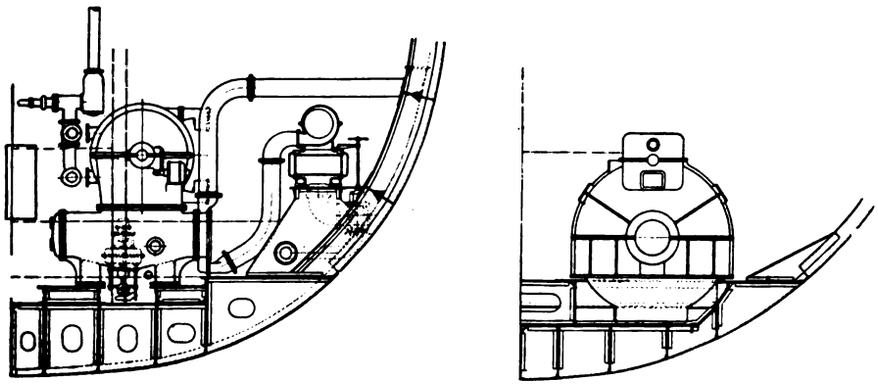


FIG. 8

The Usines Carels Freres of Ghent, Belgium, which for some time has been selling Diesel engines into this country through its American representative, W. R. Haynie, 30 Church street, New York, has sold its American patent rights to the Nordberg Mfg. Co., Milwaukee. The negotiations were completed recently in Milwaukee by A. Luckman, managing director of the Carels Co., and Bruno V. Nordberg, president of the Nordberg Co. A representative of the Carels Co. now is at the Nordburg plant and the Nordburg Co. plans shortly to manufacture these Diesel engines upon an extensive scale.

Capt. Ulster Davis has been appointed manager of the Albany & Southern railroad docks at Albany and Rensselaer terminals.

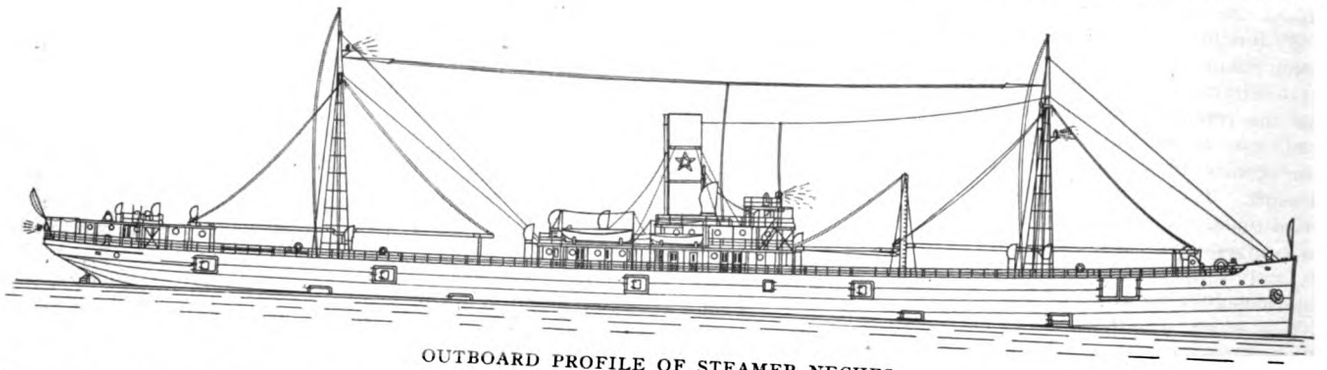
Freight Steamer Neches

The Mallory Line Is Adding Two Splendid Carriers To Its New York-Galveston Service

THE Newport News Ship Building & Dry Dock Co., Newport News, Va., launched the steamer Neches for the Mallory Line on June 27. Her sister the Medina, will be launched in a few weeks. These ships were designed by Theodore E. Ferris, naval architect and marine engineer, of New York, along lines laid down by H. H. Raymond, vice president and general manager of the Mallory Steamship Co. Their leading dimensions are:

Length over all, 421 feet; length between perpendiculars, 405 feet; beam, 54 feet 3 inches; molded depth to hurricane deck, 35 feet 9 inches; Loaded draught, 24 feet; cargo capacity, 350,000 cubic feet; dead weight capacity, 6,600 tons.

Their freight carrying capacity is large and the discharging apparatus consists of nine large cargo ports each side of 'tween decks, a large overall hatch forward and four additional cargo hatches, the largest of which is 24 feet by 15 feet. There are also six double-drum, quick-acting hoisting winches, ten 8-ton cargo booms, and in addition one 30-ton cargo derrick with compound double drive winch. There are two steel masts and two derrick posts. The Neches and Medina are of the hurricane type for the Atlantic coast freight service, having complete steel hurricane deck, main deck and lower deck. There are five transverse watertight bulkheads forming three cargo holds and 'tween deck cargo spaces. The cargo holds and 'tween decks are amply ventilated by large ventilators and cowls at the weather decks for the transportation of perishable cargo, and in addition the upper 'tween decks are mechanically ventilated by air ducts and electric fans especially provided for transporting onion cargoes and other similar commodities and further to provide against excessive temperature. The hurricane decks of these ships, in addition to being complete steel decks, are sheathed with wood caulked decks for insulating purposes.



OUTBOARD PROFILE OF STEAMER NECHES

The Neches and Medina are single-screw ships with the propelling machinery, consisting of 4,100 indicated horsepower, placed amidships. Each vessel has four single-ended, four-furnace Scotch boilers, built for a working pressure of 200 pounds, and equipped with Howden forced draft; one fire room with side bunkers and large cross bunker for a bunker of 900 tons. The boiler feed water is carried in double bottom under the machinery space; the culinary water is carried in large tanks and after peak.

The engines are triple-expansion with cylinders 29, 49 and 84 inch diameters, with a common stroke of 54 inches. There is complete complement of auxiliaries consisting of pumps, dynamoes, forced draft fans, feed water heater, oil filter, auxiliary condensing plant, ice machine, evaporators and distillers. The ships are

PRINCIPAL DIMENSIONS.

Length, fore side stem to after side R. post at main deck	405 ft. 0 in.
Beam, molded	54 ft. 3 in.
Depth, molded, hurricane deck	33 ft. 9 in.
Depth, molded, main deck	25 ft. 7 in.

EQUIPMENT.

2 Bower anchors, stockless, each	6,600 lbs.
1 Bower anchor, stockless	5,610 lbs.
1 Stream anchor, stockless	2,000 lbs.
1 Kedge anchor, stockless	1,000 lbs.
240 fathoms of 2 1/16-in. stud link chain cable	
90 fathoms of 4¾-in. S. wire (stream)	Furnished by owners
120 fathoms of 5 -in. S. wire towline	
180 fathoms of 8 -in. Manilla	
180 fathoms of 7 -in. Manilla	

SCANTLINGS.

Frames:—Spaced 26 in. apart throughout in peaks 6 in. x 3½ in. x 13.5 lbs. Angles from c to hurricane deck cut at W. T. flats. On flat of bottom 3½ in. x 3½ in. x 9.8 lbs. for about ⅓ L. amids. depending on shape of lines with 7 in. x 3.45 in. x 3.45 in. x 20.9 lbs. [around bilge to hurricane deck on every frame beyond ⅓L. to peak, bulkheads, channels will extend down to side line at keel in double bottom 3½ in. x 3½ in. x 9.8 lbs.

Rev. Frames:—In fore peak 3½ in. x 3½ in. x 9.8 lbs. to hurricane deck on every frame. In after peak 3½ in. x 3½ in. x 9.8 lbs. to main and hurricane decks alternately. Across top of floors 3½ in. x 3½ in. x 9.8 lbs. in way of channel frames. Doubled in boiler room. In double bottom 3½ in. x 3½ in. x 9.8 lbs. doubled under main main engine only. Single elsewhere.

Floors:—30 in. x 20 lbs. ½L. to 15 lbs. at ends. In boiler room 30 in. x 23 lbs. In double bottom 45 in. x 18 lbs.

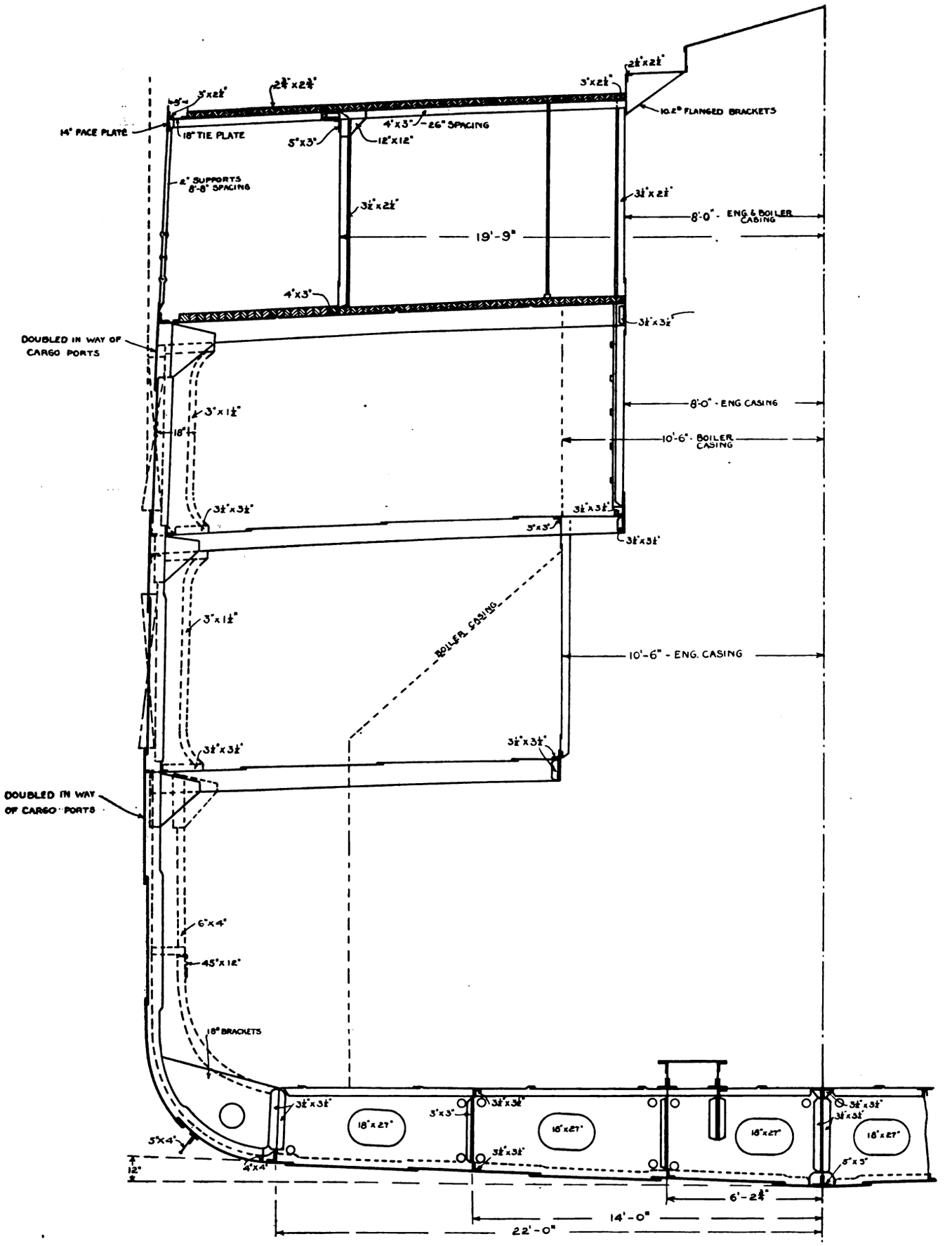
Keelsons:—Intl. plates 17 lbs. ½L. to 14 lbs. Intl. plates in double bottom 18 lbs. Intl. plates clips to shell 3½ in. x 3½ in. x 9.8 lbs. Top angles 6 in. x 4 in. x 16.2 lbs. ½L. to 14.3 lbs.

Stem:—10½ in. x 2¾ in.

Stern Frame:—Prop post 10½ in. x 7½ in. Rudder post 9¾ in. x 7½ in.

Bulkheads:—Lower half to lower deck 14 lbs. Upper half 12 lbs. to lower deck. 12 lbs. between lower and main decks, 10.2 lbs. between main and hurricane decks. Vertical stiffs. 30 in. apart below lower deck 6 in. x 3½ in. x 3½ in. x 15.2 lbs. [bracketed top and bottom between lower and main decks 5 in. x 3 in. x 9.8 lbs. 30 in. apart. Between main and hurricane decks 3½ in. x 3½ in. 6.6 lbs. 30 in. apart. Special stiffening on peak bulkheads bounding angles to shell 5 in. x 5 in. x 14.3 lbs. Bounding angles to decks 3½ in. x 3½ in. x 8.5 lbs.

Riveting:—As marked on section other items not given to be in accordance with American bureau rules.



SECTION THROUGH ENGINE ROOM

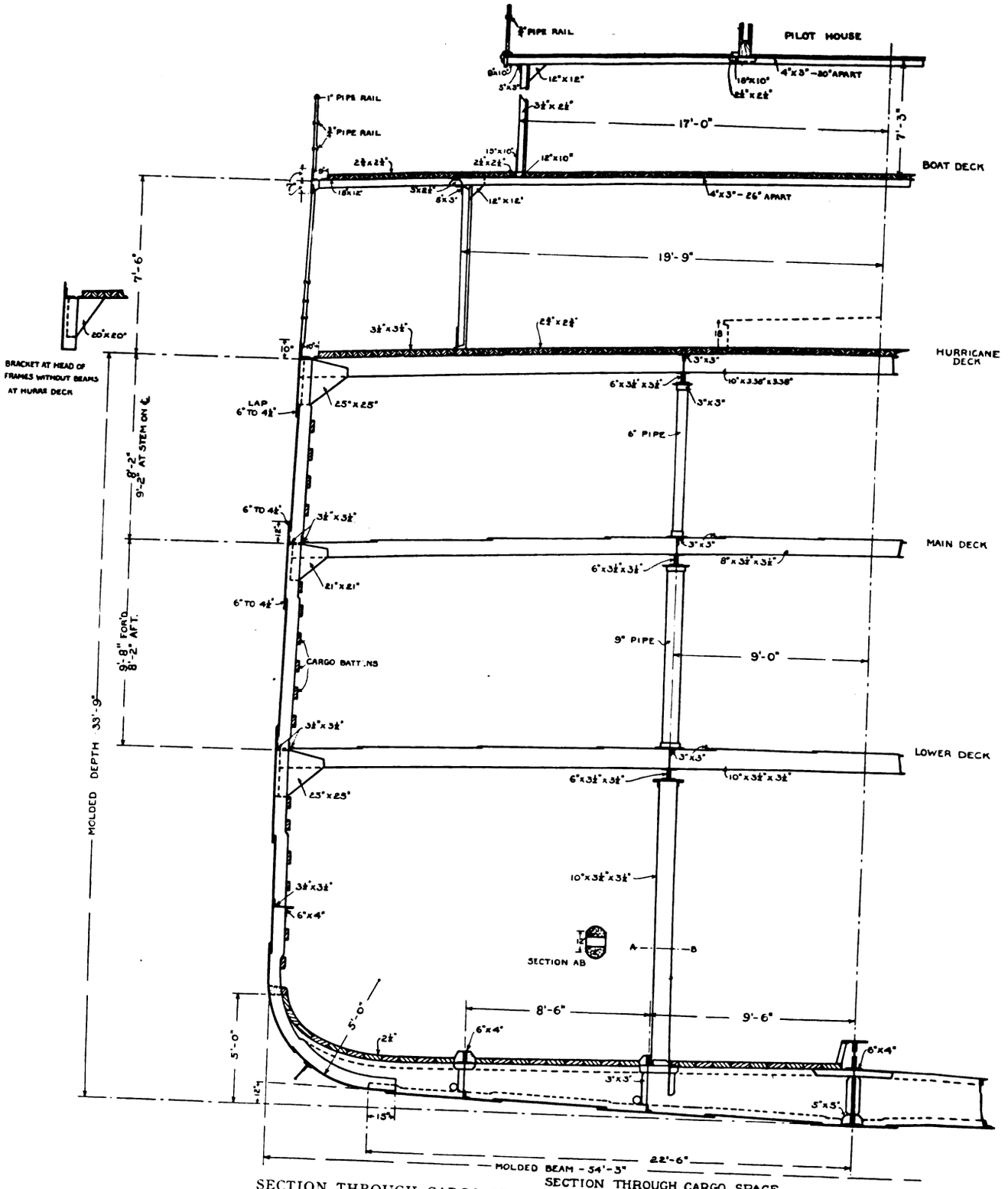
SECTION THROUGH ENGINE ROOM STEAMER NECHES

equipped with steam windlass, steam capstans, steam and hand-steering gear and an unusual equipment of deck machinery, consisting of large and powerful steam winches, electric lights through all cargo spaces and living quarters, searchlight, electric side lights, wireless apparatus, submarine bell, electric fog whistle, complete navigating outfit, together with all modern devices.

Amidship on the hurricane deck, steel deck houses are erected providing space for cold storage room, galley, mess room and crew's quarters. In steel deck house above are the officers' quarters, while superimposed are the wheel house and navigation bridge. Aft of the hurricane deck is erected a steel house for the firemen's quarters and steering engine space above which is the docking bridge.

The vessels are designed for a speed of 14 knots and will operate between New York and Galveston.

The Luckenbach Steamship Co., New York, is asking for bids on a 10,000-ton shelter-deck steamer for the Atlantic-Pacific trade, via Panama Canal, to be built to the plans of George Simpson, naval architect.



SECTION THROUGH CARGO SPACE STEAMER NECHES

SECTION THROUGH CARGO SPACE

East and West Bound Courses

The Lake Carriers' Association is Quite Determined that the Vessel enrolled in its Memberships shall observe them

THE Lake Carriers' Association has begun a strenuous campaign to eliminate, if possible, collisions due to fog in the open lake. Last spring the association, at a meeting of its board of directors, decided that all vessels enrolled in the association should follow separate courses on the Great Lakes. East bound ships are to follow an outside course and west bound ships an inside course. These courses have been plotted on the general chart and are well understood by all masters.

There have been many collisions of late in all parts of the world due to fog, and there is no question whatever but that the general public is quite apprehensive on the subject. Atmospheric conditions on the lakes are such that fog is quite prevalent in the early summer months, and it was to obviate the necessity of vessels meeting frequently head to head that the Lake Carriers' Association established definite courses for east bound and west bound vessels. Separate lanes for east bound and west bound ships were long ago established in North Atlantic trade, and the recent International Conference on Safety at Sea could find nothing to do in this respect that the steamship lines had not already done for themselves. It is precisely this same situation that the Lake Carriers' Association is desirous of accomplishing on the lakes, because the time is undoubtedly coming when the general government will make separate courses a definite rule. There can be no possible argument as to the wisdom of anticipating such governmental regulation.

Some Ignoring the Rule

Notwithstanding the fact, however, that the association unanimously adopted the rule of outside and inside courses, there are many masters sailing vessels belonging to the association who do not observe the rule. Now the sole object that the association had in mind in making the rule was to insure greater safety in navigation. When collisions occur they are invariably between vessels meeting head to head. Such a thing as a rear-end collision, while common enough on the railways, is unknown on the high seas. There is no instance on record of a steamer running into the stern of another steamer in the open lake during fog. Obviously if steamers going in opposite directions are on courses several miles apart, they are not going to collide.

The Pittsburgh Steamship Co. recently received a letter from one of its masters reading as follows:

"I have given a great deal of thought to 'Safety First', and steering the outside and inside courses is certainly along that line for every one in the sailing business. It seems to me that it will cost many lives and a lot of property before we can get the captains in line, and I think it is time something was done.

Meeting Head to Head

"When one talks to a captain that does not run the outside and inside courses, the chief argument he gives us is 'I don't want our office to tell me how I should steer my boat.' Any one will have to admit one cannot do much with him by talking. When one looks back at the many collisions that have cost so many lives and property, it is plain that had the outside and inside courses been lived up to by all the masters, many of the collisions could have been avoided.

"I seem to have had a good deal of fog this season, and you would be surprised, with the small fleet in commission, to see how many boats we meet head and head and even inside of us. Coming up Lake Superior, say, from Whitefish Point to Manitou Island, I have met no less than 15 boats, and I think, from a master's standpoint, it is time to act."

When Mr. Coulby, president of the company, received this letter, he caused a copy of it to be sent to every master in his fleet, commenting on it as follows:

"I am very glad, indeed, to receive this letter, as it is evidence that all the talking we have done in years past about safety at sea, which means strict observance of pilot laws, using inside and outside courses, is beginning to bear fruit, and that our masters are waking up to the fact that public sentiment will no longer tolerate the violation of the law with its attendant risks to life and property. The papers are filled with accidents at sea through collision in fog and the general public are now going to demand that we do everything within our power to eliminate, as far as possible, this danger from our navigation.

To Minimize Collision

"I have many times heard that the statement has been made (referred to by the captain) that the master does not want the office to tell him how he should pilot his ship. Men making these statements do not seem to realize that there is a responsibility upon the management to see that the men in charge of their ships obey the law, and any manager having knowledge of his captains willfully violating the law, such as running his ship in full speed in the fog, is, in my judgment, just as vulnerable to the most severe criticism as is the master himself. Sometimes I think the masters lose sight of the fact that they are not only responsible for the safe navigation of their own ship, but they have an obligation upon them to so navigate their ship as not to jeopardize the safety of the crew and passengers of other ships, and it was with this thought that the vessel owners of the Great Lakes adopted the inside and the outside courses. Certainly danger of collision must be minimized if the ships navigating one of the Great Lakes do so with two definite lanes fixed, one to be used by ships east bound and the other west bound. The question of the dividing line between these two courses has been fixed by a committee of the most experienced masters on the Great Lakes, and I am firmly convinced that if these courses are used by all the ships, and the pilot rules governing navigation in fog are strictly adhered to, we should very rarely have a collision. The question as to whether it is going to take a few hours longer to make the trip or not, must never be considered and will never be taken as an excuse for violation of the law. If I find any violations of the rule, even though the ship may not meet with disaster, I shall feel it my duty to take such action, with reference to the navigating officer, as though there had been a serious collision."

There was some newspaper comment on this letter which caused

President Livingstone, of the Lake Carriers' Association to procure copies of it, which he dispatched to every member of the association with a request that the matter be taken up with the masters of their individual fleets. The managers of the leading fleets on the lakes immediately got in touch with their masters, giving positive directions that east and west bound courses, as well as the pilot rules in general respecting fog, are to be observed. Among the companies that took immediate action were Hutchinson & Co., W. C. Richardson & Co., M. A. Hanna & Co., G. A. Tomlinson, Cleveland-Cliffs Iron Co., A. T. Kinney, John J. Barlum, Brown & Co., John Craig, Philip H. McMillan, W. H. Becker, E. D. Carter, A. E. Williams, W. M. Mills, H. K. Oakes, R. A. Williams, Great Lakes Steamship Co., John Mitchell and Hawgood & Co.

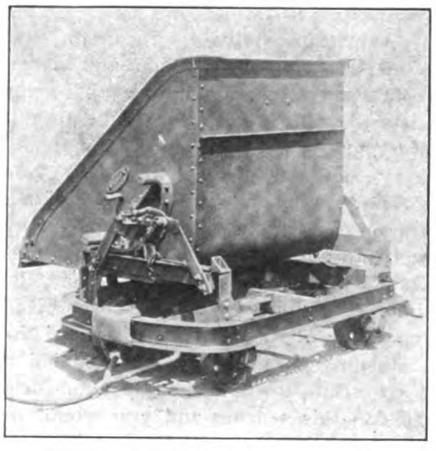
There is no question but that Great Lakes owners are determined to eliminate that form of accident as far as it is possible to do so. There was a time, not long since, when accidents due to suction were very common in the rivers. One rarely hears of them nowadays as the particular conditions which cause them are avoided. The easiest way to prevent an accident is to avoid the possibility of its occurrence. That is a very simple thing to do in suction cases and it is equally simple in fog. A vessel coming down the lakes on an outside course will never collide with a ship going up on the inside course. The lakes are becoming annually more and more congested with vessels, the traffic is annually getting heavier and definite lanes are necessary.

It would seem as though owners ought not to have as much trouble as they do in getting their masters to understand that the pilot rules must be strictly observed, and that under no circumstances must any chances be taken. The master who cannot understand is the survivor of a custom that has passed away. Vessel owners do not want quick passages regardless. They want them only when they can be safely run, and that is when the weather is clear and fair. They want the speed to be moderate in fog. No matter how successful a master may be, he will get no bouquets in the future if it is proved that he has been taking chances.

Hutchinson & Co. recently commended one of their masters for being late in reaching his destination even though they had wired him to hurry. He was delayed through proceeding under check during fog, and the company thanked him for putting the proper interpretation upon their instructions, sending a copy of the letter to all of its masters. On the other hand, a master who through great skill got his boat safely out of harbor through obstacles, was roundly rebuked by the company because the element of chance entered into the maneuver, and he was emphatically told never to attempt such a thing again. That is the policy which is making for safe navigation on the lakes.

New Part-Way Dump Car

The Bertha Mining Co. recently purchased an interesting special type of dump car for handling coal to their boilers, the car only dumping part way and remaining in position so that the material could be shoveled out easily and rapidly. When loading, the car remains in normal upright position, but when unloading it is tipped over to the position shown in the cut and held by an adjustable calk which fits under the rockers. The



DUMP CAR

car was designed for running over floor and is provided with flangeless wheel and swivel front axle with handle so that it can be pulled in any direction.

The car was designed by the Orenstein-Arthur Koppel Co., of Koppel, Pa., and the underframe is made by the Orenstein-Arthur Koppel Co.'s special wide flange channel and roller bearing.

June Lake Levels

The United States Lake Survey reports the stages of the Great Lakes for the month of June, 1914, as follows:

Lakes	Feet above mean sea level
Superior	602.49
Michigan-Huron	580.60
Erie	573.04
Ontario	246.91

Lake Superior 0.16 foot higher than last month, 0.13 foot higher than a year ago, 0.19 foot above the average stage of June of the yast 10 years, 0.94 foot below the high stage of June, 1876, and 1.25 feet above the low stage of June, 1879. Average stages of the last 10 years indicate that the July level will be 0.2 foot higher.

Lakes Michigan-Huron are 0.28 foot higher than last month, 0.60 foot lower than a year ago, 0.47 foot below the average stage of June of the last 10 years, 3.00 feet below the high above the low stage of June, 1896. Average stages of the last ten years indicate that the July level will be 0.1 foot higher.

Lake Erie is 0.13 foot higher than last month, 0.82 foot lower than a year ago, 0.02 foot above the average stage of June of the last 10 years, 1.48 feet below the high stage of June, 1876, 1.47 feet above the low stage of June, 1895. Average stages of the last 10 years indicate that the July level will be 0.1 foot lower.

Lake Ontario is 0.04 foot lower than last month, 1.11 feet lower than a year ago, 0.23 foot below the average stage of June of the last 10 years, 1.72 feet below the high stage of June, 1870, and 2.02 feet above the low stage of June, 1895. Average stages of the last ten years indicate that the July level will be 0.1 foot lower.

Commerce of Lake Superior

The commerce of Lake Superior during June, as measured by the canals at Sault Ste. Marie, was 8,588,081 tons. The movement to July 1 was 16,850,717 tons as against 25,395,363 tons to July 1, a decrease of 8,544,646 tons. Practically every commodity, except unclassified freight, shows a falling off. Following is the summary:

EAST BOUND.

	To July 1, 1913.	To July 1, 1914.
Copper, net tons	33,532	18,287
Grain, bushels	32,823,793	25,514,645
Bldg. stone, net tons	273	.....
Flour, barrels	2,671,671	2,601,482
Iron ore, net tons	15,253,802	9,113,190
Pig iron, net tons	9,665	6,241
Lumber, M. ft. B. M.	166,309	144,374
Wheat, bushels	53,572,711	45,878,817
Unclass. frght., net tons.	118,663	87,056
Passengers, number	6,975	5,779

WEST BOUND.

Coal, anthracite, net tons	1,004,028	702,339
Coal, bituminous, net tons	5,492,091	4,038,690
Flour, barrels	163	517
Mfctd. iron, net tons	135,530	96,178
Iron ore, net tons	17,192	.....
Salt, barrels	265,279	343,194
Unclass. frght., net tons	320,678	365,956
Passengers, number	7,635	6,759

SUMMARY OF TOTAL MOVEMENT.

East bound, net tons	18,286,122	11,596,306
West bound, net tons	7,109,241	5,254,411
	25,395,363	16,850,717
Vessel passages	7,180	5,795
Registered tonnage, net.	18,343,839	13,012,565